C D E F G H I J. K L M N O P Q R S T U V W Y

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Jockey Club Perfume 13.–
Jews to distinguish 16.–

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Quinine and Iron tonic 179;

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Varnish for Maps. 1.-
" Zinc 6.-
Voltaic Coil 86.-
Varnish to Smooth 89.
Varnish Gold 113.-
do Copal 113.-
do White hard 113.-
do Black for Metal 113.-
do White or red. 144.
Naptha, for furniture 170.-
" transparent 171.-

W
Y

Yeast 28. –
Yorkshire Relish 170.

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Trumpeters
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Privates.

## "Middle ages"

Are fixed to commence in A.D. 476, and end with the revival of Classical literature in the 15th Century.—

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## Fish sauce.—

Walnut pickle, mushroom ketchup, and Soy, each half a pint; chopped cloves of garlic and anchovies, 6 of each; Cayenne pepper and bruised cloves, each ½ dram.— Mix, simmer for 10 minutes: then strain and bottle.— Shallots may be substituted for garlic.

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## To preserve Meat in Summer.—

Put a few drops of Creosote in a saucer, or on blotting paper, and place it in the safe.— This will drive away insects, and preserve the meat several days longer.—

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## Varnish for paper, maps &c

Gum Sanderac 4 oz. Mastic 1 oz. Canada Balsam 2 oz. Spt Wine 1 pint.— Dissolve in a gentle heat, or water bath.— In a few days decant the clear.— The maps should first have

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a coat or two of size made from isinglass or parchment cuttings.– Crystal varnish is to be had of most varnish makers.–

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## Eye Water

Sulphᵗᵉ zinc 16 grains. Tinct. Opium 2 drms distilled water 1 pint.– Apply with a soft Rag to the eyelids.–

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## Test for Sulphur.–

Warm a little Litharge in liquor Potass: and allowing the former to subside, pour off the clear fluid.– A feather, or any body containing free sulphur will become black on being heated in a test tube with this liquid.– No other body will give a similar reaction.–

---

## Hints on Preserves.–

Its is common to add 1 lb of loaf sugar to each pound of fruit, but by boiling for an hour, ½ lb of moist sugar will suffi-cient to make the preserve keep.–

In preserving Rhubarb first boil the Rhubarb for 20 minutes; throw away this juice, then add ½ lb sugar to each pound of stalks,

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and boil for 3/4 hour.-

Jellies require an equal weight of sugar to that of the fruit.-

In making jellies; place the fruit in a jar in a pan of boiling water, until dissolved into juice; the strain through a hair sieve, or flannel bag, and to every pint of juice, add 1 lb of loaf sugar, and boil till a few drops placed on a plate readily candy.-

## Moon and Tides.-

The moon souths on every meridian 52 minutes later every day; hence the tides observe the same retrogression.-

## Standard Gold & Silver

Standard gold coin is 22 carats fine, or 22 parts of gold alloyed with 2 of copper in every 24 parts.- 20 lbs troy of this alloy are coined into 934½ sovereigns

Standard silver is an alloy of 11oz 2 pennyweights 37 grs of pure silver, and 18 dwts of copper to 1 lb troy.- and is coined into 66 shillings.-

## Moths.-

Spts of Turpentine or Camphor will drive them away

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## Influence of Moon on weather

Marshall Bugeaud states it as an infalliable rule, that if the 5th & 6th days of the moon resemble each other, the weather will during the whole lunation be the same as on the 5th. – But if the 6th resembles the 4th, then it will correspond with the latter. –

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## Lac of Rupees

A Lac in the East is 100,000 rupees, which at 2/- sterling each amounts to £10,000. –

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## Polishing paste for brass. –

Rotten stone 4 oz: Oxalic acid 1 oz: Sweet oil 1½ oz: Sp. turpentine, enough to make a paste. – Finish by washing the brass in a solution of 1 oz of rock alum in 1 pint of water: when dry, rub with wash leather and fine tripoli

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## Plate powder. –

Rub away in a mortar 1 oz of mercury with 7 oz of precipitated chalk. –

Polisher's putty or and burnt hartshorn, each ¼ lb. – prepared chalk ½ lb. –

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## Water Cement.

Good grey clay 4 parts, Black oxide Manganese 6 pts, slaked lime 60 pts. - Mix, calcine, and powder. - It will harden rapidly in water. -

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## Cure for Corns. -

Sir H. Davy's. - Potash 2 parts, Salt of sorrel 1 part, each in fine powder. - Mix, and lay a small quantity on the corn for 4 or 5 successive nights, binding it on with rag. -

Soft corns may be relieved by inserting cotton wool dipped in sweet oil between the toes.

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## Black Cloth Reviver

Blue Galls bruised 2 oz: Logwood and Sumach, each ½ oz. Vinegar 1 pint. - Macerate in a closed bottle, with heat 24 hours; then strain off the clear, and add Sulph: Iron, & Iron filings, of each ½ oz. - and shake frequently for a week. -

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## Artificial Ivory. -

Dissolve Amber 12 oz. and Gum Sowrie 3 oz in Wood Spirit or Spts Wine; then add 7 oz of fine kaolin or China Clay, and mix them thoroughly by

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stirring aided by a gentle heat.— The composition may be placed in dies and moulded into various forms.—

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## Black Varnish for Zinc.—

Dissolve 2 pts: of Nitrate of Copper, and 3 pts: Crystallized Chloride of Copper in 64 pts of distilled water; then add 8 pts of muriatic acid of 1.180 Sp: G:— Shake the mixture, and plunge the Zinc, previously well scoured with fine sand, into it, for a short time; then wash it in cold water, and dry rapidly.— The surface will now be coated with a metallic alloy of a beautiful black color.

By adding a little gum arabic to the above, it may be used as an indelliable ink for Zinc, or iron.—

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## Ginger Beer.

To each Gallon of water put 2 lbs sugar, 2 Lemons sliced, 2 oz powdered Ginger, and a desert-spoonful of Cream of Tartar.— Simmer on a fire for ½ hour,— and when about new milk warm add a table spoonful of Yeast. Let it work, then bottle.—

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## Explosive Spiders.—

Cut a piece of cork into the shape of a

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spiders body, and dip it into ink, to color it. A few black bristles stuck into it will represent legs. - Hollow out the under side of the belly which is to be filled with Iodide of Nitrogen, and place the spider where it is to remain, while the explosive is yet moist. - In from half an hour to an hour it will have become dry, when the slightest touch — even dropping it upon water — will produce a loud detonation. -

## Iodide of Nitrogen. -

For every dozen spiders take 6 grains of Iodine, or about as much as will lie upon a fourpenny piece, and placing it in a cup or wine glass, pour upon it a tablespoonful of the strongest Hartshorn. - Stir them together with a glass rod, and allow to remain 1/2 hour. - The Iodine will have lost its distinctive character & become like brown earth. - It has combined with the Nitrogen of the ammonia, and become the Iodide of Nitrogen — the most easily exploded body known. In the moist state, contact with hot iron merely causes it to rise in vapour, without explosion. - Stranger still, if it be artificially dried, and

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the dried mass beaten, it can seldom be got to Explode.— But if allowed to dry of its own accord, and then touched — or even dropped on water — it Explodes instantly.—

To charge the spicers; fill the cavities left for the purpose with the moist paste, by means of a split quill or slip of glass, and place them where they are to remain.—

In quantities of 5 or 10 grains, Iodide of Nitrogen is not dangerous to any part but the eye, even should the whole Explode.—

The chloride of Nitrogen — an oily compound — is difficult to manipulate, and fearfully dangerous.—

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## Marking Ink.

Nitrate of Silver 1½ drm. Water 6 drms. Mucilage 2 drms.— Add as much strong Ammonia as will redissolve the oxide of Silver at first precipitated. NB. Add the ammonia before the mucilage.

This ink requires no preperation before writing.—

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## Liquid Glue.

Boil 1lb of parchment in 6 Qts: of water till reduced to 1 Quart.— Strain, and reboil the

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dregs till converted into glue.—

Another.—

Dissolve Borax 1oz in water 1 pint, and add Shell lac 2 oz, and boil in a covered vessel till dissolved.—

Another.—

Dissolve 2 oz shell lac in 1 pint Naptha.

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## Gutta Percha Soles to apply.—

Dry the old sole perfectly and roughen its surface with a rasp.—Then put as much Gutta percha solution as will cover it over, in a cup immersed in boiling water.—Next immerse the new sole in hot water till it is soft.—Wipe it dry; and having covered the old sole with a thin coat of solution which must be well rubbed in and allowed to set, hold both the new sole and the shoe to the fire till they become sticky, when the sole must be applied, commencing at the toe, and proceeding gradually backward.—In half an hour it will be ready for paring.—

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## Mahogany Stain

Dissolve Socotorine Aloes 1 oz: Dragon's blood ½ oz. in Rectified Spirit wine 1 pint.-

Apply 2 or 3 coats to the wood, and polish with bee's wax and turpentine, or olive oil colored with Alkanet root.-

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## Nervous action, rapidity of.-

M: Fizeau has invented a cylinder revolving 1,000 times a second, with subdivisions indicating the ten millionth part of a second, by which can be determined the speed of sensation and voluntary motion.-

If the interval between an electric shock and the resulting contraction be noted, the exact time required for the transmission of the sensation, to the action of the brain will be determined. Repeated experiments give the following results.

1st. Sensations are transmitted to the brain at a rapidity of about 180 feet per second; and this rate is nearly the same in all individuals.

2nd. The brain requires $\frac{1}{10}$th second to transmit its order to the nerves of voluntary motion but this amount varies considerably in different individuals, and in the same individual

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at different times. –

3ly. The time required to transmit an order to the muscles by the motor nerves is nearly the same as required by the nerves of sensation to communicate feeling

4thly. The the order passes $\frac{1}{100}$th second before the muscles act. –

5thly. The whole operation in the human subject occupies approximately about $\frac{1}{4}$ second. –

Hence it follows that the active and ardent are capable of thinking, feeling, and acting more quickly, than the slow and apathetic. –

Note. – It occurs to me that the electric shock is not a conclusive means of testing the above; as it is capable of producing contractions in the muscles themselves through their own inde-pendant irritability, even though severed from all connection with the brain; and this in the dead body, as well as in the living. –

I have observed, that in the operation of docking a horse, somewhere about 2 seconds elapses from the application of the hot iron to the stump of the tail before the animal makes a motion to avoid it. – Thus requiring 1 second to convey the sensation of pain from the tail to the brain, and another second to put the voluntary muscles in operation

A. S. M. –

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## Sherbet.

cream of Tartar 1 Oz

Mix Carbonate Soda 3½ Oz; Tartaric acid 2½ Oz finely powdered loaf sugar 12 Oz: well in a mortar, after having exposed the ingredients seperate in a warm oven for a few hours; then add a few drops of essential oil of Lemon. keep in dry bottles well corked.— A couple of teaspoonfuls in half a pint of water, makes an agreeable drink.—

---

## Stimulating Oint.

Oint. Nitrate of Mercury 1 Oz: Camphor 1 dram; Sp. turpentine 2 Drams; Olive oil 4 Drs.

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## Camphor Ball

Melt in a jar 1½ Oz Spermaceti; White wax ½ Oz Powdered Camphor 6 drams; and Olive oil 2 Oz:—

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## Copying Ink.—

Excellent Copying ink may be made by adding a teaspoonful of sugar to a quarter of a pint of good Black writing ink.— If you have not a proper copying press, lay the damped paper upon the writing, and pass a warm flat iron over it.—

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## Lavender perfume.

Put ½ oz Lavender flowers into a bottle with 1 pint of Vinegar; cork, and let it stand for 2 days. - Then place the bottle in a pan of hot water and let it stand on the hob by the fire for 10 hours. When cold, strain off the vinegar, and keep in a well corked bottle. -

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## Jockey Club Perfume.

Oil of Lavender 6 drms; Essence of Bergamot 3 drms; Ambergris 1 drm; Musk 2 grs; with a bottle of Eau de Cologne. -

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## Distance by Sound.

Sound travels through air at a speed of 1142 feet a second. - Thus, the number of seconds between a flash and the report multiplied by 1142 will give the distance in feet. - Or the same multiplied by 3 and divided by 14 will be the distance in miles. -

---

## Best kinds of Fruits. - (Glenny)

### Apples. -

Ribston Pippin, Blenheim Orange, Kerry Pippin, Fearn's Pippin, Hawthornden, Court of Wick. -

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Pears. -

Williams' Bon Cretien, Pas Colmar, Bergamot, Maria Louise, Van Mons, Chaumontelle. -

Plums. -

Greengage, Coe's Golden drop, Chaffman's Prince of Wales, Washington, Victoria, Royal Hative. -

Cherries

Begareau, Black Tartarian, Elton, May Duke, Late Duke, Morello. -

Peaches. -

Royal Scoye, Grosse Mignonne, George the fourth, Noblesse, Belleyarde, Malta. -

Nectarines. -

Elruge, Early Newington, Roman, Pitmaston, Orange. -

Apricots. -

Moor Park, Large Early, Breda, Royal Orange, Musch Musch, Brussels. -

Raspberries. -

Carter's Prolific, Antwerp, Fastolf, Red & White Double bearing. -

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Currants.—

Red Grape, White Grape, Black Grape, and Monstreuse de Berry.—a fine heavy bearing red.—

Gooseberries.—

Warrington, Champagne, and Wilmots'.—

Open air Grapes.—

Sweet water, Royal Muscadine, Miller's Burgundy, Black Hambro.—

Hot house Grapes.—

Muscat, Hambro, Bowood Muscat, Cannon Hall Muscat, Golden Hambro, Black Do.—

Strawberries.—

Keen's seedling,—the very best; British Queen; Elton, a later kind; For successions, Myatt's Eleanor; Carolina Superba, and Robertson's Wizard of the North,—said to beat every thing.

Note.—The most valuable kinds are mentioned first.—

---

## Etching on Steel.—

First cover the part turpentine varnish tinged with a little Lamp black.—When dry, write the words to be etched with a pointed instrument.—Next, surround the inscription with a wall of wax, and then pour on the part some diluted

Serjeants. Corporals. Trumpeters. Farriers. Privates.

Aqua fortis, and allow it to remain till the work is "bitten in" sufficiently deep. Then boil well in cold water, remove the wax enclosure, and wash off the varnish with Spt turpentine. –

Or

A strong solution of Sulphate of Copper with a little muriatic acid, may be used, instead of the Aqua fortis. –

---

## Diamonds to estimate Dr.

Diamonds are estimated by the Carat of 4 grains

| | £ | | £ |
|---|---|---|---|
| 1 Carat is worth | 8 | 10 Carats are worth | 300 |
| 2 " " | 16 | 20 " " | 3,300 |
| 3 " " | 72 | 30 " " | 7,200 |
| 4 " " | 128 | 50 " " | 20.000 |
| 5 " " | 200 | 100 " " | 80.000 |

A full sized diamond exceeds in value 100,000 times its mass of pure gold. –

The Diamond and the Garnet, are distinguished from all other precious stones by their having only single refraction; all the others having double refraction, or giving a double image of a taper when viewed through their facets. – By the same means, all precious stones except diamond, garnet, and Spinelle, may be

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distinguished from artificial ones, by the true gems having double refraction, while the counterfeits have only single. — Even when they are set opaque so that he cannot see through them, it is easy to find whether the refraction is single or double, by looking into the stone at the image reflected of the posterior facets. — If any of the precious stones, or artificial imitations are immersed in alcohol or water, they lose their lustre, while a diamond does not. —

If applied to the tongue, a real stone feels colder than glass. —

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Oxalic acid to distinguish from Salts.

Drop a crystal in a drop of ink; if it is Epsom Salt, no change occurs: but if it Oxalic acid, a distinct brownish red is produced. —

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Ginger Beer.

Lumps Sugar 1lb: Bruised Ginger 1oz; Cream of Tartar ½oz; 1 Lemon sliced; 1 Gallon of boiling water must be poured on, and then cover up and let it stand till barely lukewarm; then strain, and add 4 tablespoonfuls of Yeast. Let it work for 3 or 4 days according to the weather. Finally, skim, strain through flannel, and bottle.

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To remove Gunpowder from the skin.

Apply a fly blister over the marks, and keep the sore running by means of turpentine, or green ointment, for a week, and then permit it to heal. — As the new skin forms the tattooes will disappear. —

The stimulating ointment page 12, will be an excellent application. —

---

Fly poison. —

Mix 1 teaspoonful of black pepper, and 2 teaspoonfuls of moist sugar, in new milk to the thickness of a syrup, and place it in a saucer in their haunts, when they will rapidly disappear. Add more milk as often as it dries. —

---

## Atmospheric Moisture. —

The annual amount of evaporation from the earth in Great Britain averages 32 in. of water. — Of this amount less than 3 inches is raised in the 3 months of November, December, and January. — While in June the maximum of 4 inches is attained. — In the tropics the annual evaporation attains to 90 to 100 inches. —

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The amount of vapor the air is capable of holding in suspension varies with its temperature. - At 32° it can only retain $\frac{1}{160}$th of its own weight; and this amount is doubled by every 27° rise, so that at 59° air can contain $\frac{1}{80}$th; and at 86° $\frac{1}{40}$th. -

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## Compass, Variation of. -

The variation of the compass in England in the present year 1870, amounts to 2¼ points or 25°. 18'. 45" to west of North. Hence when the compass is fitted with a floating card. the true bearing of any place or object is found by adding 2¼ points to the left of the magnetic bearing, and true North is opposite N. N. E. ¼ E. - This variation of the compass is found gradually to increase and diminish in cycles, from year to year. -

---

## Sensible Horizon, to compute distance of. -

To the height of the eye in feet add half the height, and Extract the square root of the sum: the result will be the distance in Statute miles. - Thus, a person standing on the sea-shore with his eye elevated 5 feet 5 inches

above the Level of the waves will only be able to see an object on the immediate surface of the sea at a distance of $2\frac{7}{20}$ miles, = 2 miles 1496 yards. Since 2·85 is the square root of 8·1 or very nearly.—

---

## Food.

The following amounts of different articles of food necessary to support life for 24 hours, in a state of rest, are as under.

| | Serjeants. | Corporals. | Trumpeters. | Farriers. | Privates. | |
|---|---|---|---|---|---|---|
| White bread, alone, | lb | 0 | 6½ | | | |
| Potatoes | " | 13½ | | | | mostly carbon |
| Apples | 1 | 4¾ | | | | |
| Oatmeal | " | 3½ | | | | |
| Gelatine | " | 3½ | | | | inert as food |
| Cheese | " | 3½ | | | | |
| Lump sugar | " | 3½ | | | | only Carbon |
| Flour | " | 3½ | | | | |
| Pea meal | " | 3½ | | | | |
| Ground Rice | " | 3½ | | | | only Carbon |
| Arrow root | " | 3½ | | | | do |
| Cabbage | 2 | 4½ | | | | |
| Carrots | 1 | 4½ | | | | |
| Mackerel | " | 8 | | | | |
| Whiting | 1 | " | | | | |

| | Serjeants. | Corporals. | Trumpeters. | Farriers, | Privates. |
|---|---|---|---|---|---|
| | lb Oz | | | | |
| Butter — — — — | " | 1 3/4 | | only carbon & hydrogen | |
| Cocoa nut — — — | " | 1 3/4 | | Do | |
| Lean Beef — — — | " | 6 1/4 | | | |
| Lean Ham — — — | " | 7 9/10 | | | |
| Lean Veal — — — | " | 11 4/10 | | | |

## Tetanus or Locked jaw.—

A severe case of 40 hours standing, and arising from an wound in the foot, was cured during the war in America, by applying tobacco steeped in hot water till quite soft, to the pit of the stomach.— In 5 minutes extreme nausea and prostration ensued, and in less than 10 minutes, the rigid muscles relaxed, and his jaws fell open.— The tobacco was immediately removed, and Whisky administered to stimulate him, and in 2 or 3 days he was quite well.—

## Chronology.—

Mariner's Compass dis: about 1300 A.D.

## Sulphurous Acid.—

To procure sulphurous acid gas, a mixture

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of Sulphate of iron and Sulphur is heated together in a retort, when if the connecting tube is dipped in water, a Solution of Sulphurous acid is readily obtained. –

---

Iron in Blood, to detect.

Evaporate the blood to dryness, – and incinerate the dry residue in an Earthen crucible till the organic portion is all consumed. Then treat the remainder with dilute Hydrochloric Acid in a test tube over a Spirit Lamp, and to the filtered Solution add a Solution of Yellow Prussiate of Potash. – The blue precipetate is the iron.

---

Sulphur in Feathers to detect.

Heat a little Litharge with Liquor Potassae. – Decant the clear fluid; apply heat, and immerse white feathers in it, when they will become blackened, by the combination of their constituent Sulphur with the Lead, forming Sulphide of Lead. –

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## Substitutes for Turnips.

Sheep.- 1 lb per head, of the refuse of Indian meal from Starch works, mixed with 1 cheat chaff or cut straw, was found to keep Ewes in lamb as well as those in milk, in excellent condition.- The meal and chaff were steeped in water with a portion of salt for 12 hours, and was eaten greedily.- Cost 7½ per week.- 3 lb of meal per day, mixed in a similar manner with chaff, is excellent for young Cattle.-

Bean meal, or ground oats and barley, are the best food for both growing and fattening cattle, especially if given in conjunction with 3 or 4 lb of linseed cake per day.-

Potatoes are excellent feeding for both cattle and sheep.- From 2 to 3 Stones a day, along with turnips, will fatten cattle rapidly.- But if given to sheep for a longer period than 8 or 10 weeks, they affect the kidneys so as ultimately to destroy them.-

Mr Hope, Fenton Barns. E. Lothian.-

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Capillary attraction of Soil.-

1 cubic foot of Clay will hold 48 lbs of water.-

Air-dried sand placed in a glass tube with the under end immersed in water, absorbed the water to a height of 9 inches in 20 minutes; while it only rose through finely pulverized clay 3 inches in the same time.- In 7 hours, the sand was moistened to a height of 15 inches, and the clay to 5 inches.- The capillary power of sand, however, was quickly exerted and soon exhausted; as at the end of 132 days, the water never rose above 23 inches.- On the other hand, although it rose slowly in the clay, it rose steadily, and at the end of 132 days, it stood at 34 inches.- Thus, 23 and 34 inches, may be assumed as the utmost limit of Capillary ~~at~~ attraction in sand and clay respectively. Coarsely powdered clay only raised water 15½ in:

Capillary attraction, may be defined, as the triumph of adhesion over cohesion and gravity combined.- When any body is immersed in water and withdrawn, its wetness is explained by the fact, that the adhesion of the liquid to the object is stronger than its cohesion to the water remaining in the vessel, or to the downward force of

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gravity.- Thus porous bodies, such as soils, by the superior force of adhesion, are capable of lifting long columns of water through their interstices, until the weight of the columns so lifted counterbalances the attraction of adhesion, and the limit of the force is reached.-

---

## Pulleys.-

To find the velocity ratio; observe how many feet of rope it is necessary to haul out of the upper block, to raise the weight one foot.-

To find the mechanical efficiency; attach a load of known weight to the load hook, and find what weight is required to raise it.-

A comparison of these numbers, which would be exactly equal in a perfectly frictionless machine, will show how much of the power is lost by friction.

When the mechanical efficiency is less than half the velocity ratio, the machine does not overhaul.-

The power of a three sheaved pully block, is about 4 fold; of the differential pully, 6½ fold.- The latter does not overhaul.-

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## Feathers, to dye.—

First, scour them well with soap and soda in hot water; then rinse well in cold water.

Pink.—

Safflower and lemon juice.—

Red.—

Steep them in a boiling hot bath of Brazil wood, after first steeping them in alum water.

Blue.—

Of various shades is obtained from Indigo.—

Yellow.—

From Turmeric and Alum.—

---

## Postal Charges. Mar: 16th 1871.—

Only two rates are charged, viz: letters or parcels, and newspapers or books.—

| Letters | | Newspapers and open Cards, ½.— |
|---|---|---|
| up to 1 ounce | 1 | |
| 1 to 2 " | 2 | |
| 2 " 3 " | 2½ | |
| 3 " 4 " | 3 | |

and so on, up to 12 ounces, which is the maximum for parcels. For parcels open or closed, the charge is the same.—

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Money orders. –

10/ or under – 1°
£1 – – – – 2
2 – – – – – 3

And so on up to £10. –
Postmasters no longer to cash postage stamps.

---

## National debt. –

At one time the British national debt, was £800,000,000. – which would weigh in gold 6,276 tons. – which would require 12,552 carts, (to convey them,) each laden with half a ton, or with 63,735 sovereigns. – And allowing 20 feet space for each cart, the procession would cover 48 miles of road. – If moved by railway, with 10 tons of sovereigns in each waggon, it would require 16 trains of 40 waggons each train. – If piled upon each other we would have a golden column 788 miles high. – And if it was erected on the Lizard point, – the most southern part of England, – and it was to topple over, its upper part would be scattered in the north sea, 24 miles beyond Ultima Thule in Shetland. If these sovereigns were placed on the ground in a continuous line side by side, they would reach over 11,016 miles, or nearly half round the earth. – 21 sovs: placed side by side, extend 18 inches. – Now, if these 800,000,000 were placed in rows of 21 side by side,

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we shall have a golden pavement, along which a man could walk, of about 528 miles in length and 18 in: broad.— Or from London to John O Groats' House.— If all those sovereigns were placed close together, they would cover 112 Acres of land;— and would employ a Cashier counting 100 a minute for 6 hours daily, on the 311 working days of the year, 71 years 5 months and 2 days.—

---

Yeast.—

Put 2 oz of Hops to 4 qts of water, and boil for ½ hour. Then strain.— When new milk warm, add 1 lb flour, 1 lb sugar, and a handful of salt.— Let it stand 2 days, and on the third add 3 lbs of mashed potatoes; after which allow it to stand another day;— Then strain, and bottle.—

It is best 9 days old before use.— This requires no yeast, and will keep for any length of time.—

Use a teacupful to a stone of flour.—

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Plaster for Asthma.—

Diachylon plaster 2 oz. Powdered Camphor 4 drms: Opium 2 drms, Sweet oil 40 drops.

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melt the diachylon with the oil, then stir in the powders as it begins to cool.-

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## Expectorant for Asthma

Syrup of Squills 4 oz. Milk of Guaicum 6 oz. Ipecacuanha wine 2 oz. Mix.- Dose, a small teaspoonful 4 or 5 times a day.-

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## Burns or Scalds.-

Apply creosote, or a Liniment of equal parts of soft soap, basilicon oint: Turpentine and water.- If very hot and painful, a poultice over the face of which a few drops of creosote, or a little of the Liniment is smeared, may be applied.- After it has remained on 24 hours, dress with Spermaceti oint.-

Plunging the part in cold water immediately, will frequently obviate injury.-

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## To soften Horn.-

To 1 lb of wood ashes, add 2 lb of quicklime, and 1 gt of water, boil till reduced to $\frac{1}{3}$.- If the plume of a feather dipped into it comes off, it is right: if not, boil longer.- When settled, decant off the clear fluid,-(it is a solution of Caustic Potash) Shavings of horn soaked in it for 3 days, will

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become soft enough to mould into any form desired. –

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## Elderberry Wine. –

Bruise the berries with the hand, and strain. let the liquor settle 12 hours. – Add to every pint of juice 1½ pt of water; and to every gallon of this liquor 3 lbs of sugar. – Place it on the fire, and when nearly boiling add the whites of 4 or 5 eggs to clarify it. – Let it boil 1 hour, and when nearly cold, add some yeast, and ten it; filling up the cask from time to time with liquor saved for the purpose. – An 8 gallon lot will be fit to bottle in a month, and fit for use in 12 months. A hogshead will require to stand 3 or 4 months before bottling. – Add to every gallon of Elder liquor 1 pt of strong Mountain wine. –

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## Mock Indian Ink. –

Dissolve 6 parts of Isinglass in twice its weight of boiling water, and one part of liquorice in 2 parts of boiling water. – Mix both together while warm. Then incorporate, by little at a time on a slab with a spatula, – 1 part of fine ivory black. – When made evaporate in a water bath, till reduced to a paste

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them mould into rolls. —

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## Eggs to preserve. —

Put them into a colander, and dip them for an instant in boiling water. — Rub them over with butter. — Dip them in melted lard or fat. — Immerse them in lime water. — Paint them over with gum water. — Varnish them with Lac Varnish. — keep them in strong brine. — Or in the following mixture. — Put a bushel of lime into tub with 2 lb of salt, and ½ lb Cream of tartar. — Add as much water as will render the mixture of the consistance strong enough to float an egg and keep the eggs in it till wanted for use. — They have been preserved 2 years in this. —

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## ~~To estimate the weight of Fish.~~ —

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## Silvering Mirrors. —

Spread a sheet of tinfoil on a flat table, and smear mercury over it with a hare's foot. — Lay the glass upon it, and load it with weights, to press out the excess of mercury. — In a few hours it will have adhered to the glass. — 2 oz of mercury are sufficient for 3 sq feet of glass. —

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## Soldering Iron or other Metals without fire.—

Take 1 oz each of Sal ammoniac, com: salt, calcined tartar, and Bell metal; with 3 oz Antimony.— Pound them well together, and sift.— Put them in a piece of linen, and enclose it completely in Fuller's earth 1 inch thick.— Let it dry.— Then put it between 2 crucibles over a slow fire.— Urge the fire by degrees till the lumps become red hot and melted.— Let the whole gradually cool, and pound it into powder. Lay the parts to be joined on a table, with their ends as near as possible.— Make a crust of Fuller's earth, so that holding to each piece and passing under the joint, it should open over it on the top.— Then throw some of the powder between and over the joint.— Next dissolve some borax in hot spirit of wine, and drop it with a feather on the powder at the joint, when it will immediately effervesce. As soon as the effervescence ceases, the soldering is effected:— file or grind off any roughness

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## Baked Custard.—

Boil 1 qt Milk with the rind of a lemon, a stick of Cinnamon, and 4 oz sugar.— Let it cool,

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and strain. — Beat the yolks of 8 eggs, and add to the milk gradually. — Line shallow tart pans with paste. — Pour in the custard; grate a little nutmeg over it, and put into the oven. Bake slowly for 1/2 hour. — Serve cold. —

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## Camphor Mixture. —

Rub 1/2 drm of Camphor down with 10 drops of Sp. Wine, then gradually add 1 pint of distilled water, and strain through linen. —

Dose 1 oz or 1/2 oz. — Dose of Camphor 3 to 5 grains. —

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## Devonshire Junket. —

Put some brandy into a bowl, with sugar and nutmeg; then fill it with warm new milk, and add a little rennet to turn it into curd. — Then cover the top with clotted cream. —

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## Beer cup. —

Into 2 qts of beer squeeze the juice of 5 lemons then add 3/4 lb sugar; and strain, and let it stand for a short time. — If flat add a little Carbonate of Soda. —

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## Explosive force of Gunpowder.

The force exerted by exploding gun-powder is equal to 101.021 atmospheres or 620 tons on the square inch. — Explodes at 360° F. —

## Colours.

Primaries.

| Helmholtz | Maxwell | Others | Solar Spectr. |
|---|---|---|---|
| Red | Scarlet | Yellow | Red |
| Yellow- | Green | Red | Green |
| Green | Blue | Blue | Blue |
| Blue | | | Orange |
| Violet | | | Yellow |
| | | | Sea green. — |
| | | | Indigo |
| | | | Violet. — |

## White.

Red + bluish green = yellow + Indigo = white
Red + bluish green + indigo = — — — "
Red + greenish blue — — — = — — "
Yellow + indigo — — — — = — — "
Orange + blue (Prussian) — = — — "
Greenish yellow + Violet — — = — — "

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Green + indigo — — — = Bluish green
Blue[8] + Red[5] — — — = Purple
Red[5] + Yellow[3] — — — = Orange
Yellow[3] + Blue[8] — — — = Green
Indigo + Lake + Sepia = neutral Grey
Indigo + Lake + Vandyke Brown Do
warmer or colder, according as the Blue and Lake or the Sepia predominate &
Gamboge[3] + indigo[8] = a full vivid Green —
Lake[5] + indigo[8] = a rich purple —
Lake[5] + Ultramarine[8] = a pure purple —
{ Sepia + Gamboge = a warm Citron Green.
{ Sepia + indigo = dark neutral green —
These two last mixtures are useful in landscape foliage —
Vermillion[5] + Gamboge[3] = rich Orange —
Ultramarine is the purest blue, useful in skies and distances. —

Orange is the warmest colour in nature, and Red and Yellow are warm as they approach this hue: thus Lake is a colder red than Vermillion, or light Red; and Gamboge a colder Yellow than Ochre. — Grey is the cold Neutral, Brown the warm neutral. —

All cold colours which are to serve as shadows to warmer colours should be laid on

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first: and generally, warm colours over cold should be the rule. –

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## Colours used by Architects to express various substances. –

Brick work in plans and sections – Crimson Lake
Do in Elevation. B. Sienna + C. Lake
Fir wood – Raw Sienna. –
Oak or Teak – Vandy: Brown. –
Granite – pale Indian ink. –
Stone – Yellow ochre or pale Sepia
Concrete – Sepia with dark markings.
Wrought Iron – Indigo
Cast-Iron – Payne's grey, or neutral tint.
Steel – pale Indigo tinged with Lake. –
Brass – Gamboge or Roman Ochre.
Lead – pale Indian ink tinged with indigo.
Clay or Earth – Burnt Umber. –
Slate – Indigo and Lake. –

---

Vermillion + Emerald green = Grey with yellow tint
Chrome yellow[3] + Indigo[8] = a distinct green. –
Blue + Green = Sea Green
Almond Blossom is made by mixing
Red and Blue. –
Red + Green = Yellow. –

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Tones, or Shades, signify colours mixed with varying proportions of white or black. - White weakens the tone of a colour. -
Black breaks up and darkens a colour, but does not deepen it, forming shades. -
Grey, which is a mixture of Black and white, at the same time dulls and weakens a colour. -

Every colour admits of three scales. -
1. - The reduced; by mixture with white, called a tint. -
2. The darkened; or mixture with black, called shades. -
3. The dulled; - when mixed with both white and black (Grey)

Hues, include all Tertiary colours, and all those colours in which ~~the~~ one or other of the primaries predominate over the Equivalent for forming a secondary. - The 6 normal tertiaries are merely dulled tones of the 3 primary and the 3 secondary colours. - All tertiary colours are dull. -

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Other mixed colours. -
Middle chrome yellow + White = Cream colour
Ultramarine + white + a touch of raw Umber = a light greyish Blue. -

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Purple + Brown + white + a little Orange Chrome = Chocolate.–
Vermilion toned with Ultramarine = a rich Indian Red.–
Ultramarine shaded with Black = deep dark Blue.–
Brown Lake = rich Maroon.–

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The brightest Pigments – nearest the spectrum Blue – Ultramarine :– Red – French Carmine :– Yellow – Lemon Chrome :– These are primaries.–
Secondaries. to the above.–
Pale green Lake, often called drop green :– Orange chrome, the colour of a ripe deep orange rind :– Purple – obtained by mixing pale German Ultramarine with an equal portion of Crimson Lake, tinted with white to bring to the same depth as the green :–

---

A list of useful colours. – Those marked with a dagger are seldom used.–
Yellows :– †Kings yellow (not a permanent colour) ; – pale chrome †; Lemon Chrome, the colour of a ripe Lemon; Orange chrome, the colour of a ripe Orange; Yellow Lake †;

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Indian yellow †;
Reds: – Vermilion; Carmine; Crimson Lake,
Blues: – Cobalt †; German Ultramarine;
both deep and pale; – Antwerp blue; –
Indigo; Coelestial blue. –
Greens: – Emerald; Green Lakes, pale
and deep. –
Browns: – Raw Turkey Umber; Vandyke;
Venetian red; Purple and brown Lakes. –
Black; Vegetable black. –
White, flake. –

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Harmony of colours. –

A complementary colour to any other, is that which together with it, completes the presence of the three primary colours. Thus the following table shows at a glance how each of the secondary and tertiary colours are formed and the proportions in which they harmonize.

| Primary colours | | Secondaries | | Tertiaries. – |
|---|---|---|---|---|
| Red | 5 | Orange – 8 | | citrine, or yellow tertiary. – 19. – |
| Yellow | 3 | | | |
| Blue | 8 | Green – 11 | | |
| Yellow | 3 | | | |

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Primary colours Secondaries Tertiaries.-

| | | | |
|---|---|---|---|
| Blue — 8 | Purple — 13 | Russet or red tertiary 21. | |
| Red — 5 | | | |
| Red — 5 | Orange — 8 | | |
| Yellow — 3 | | | |
| Blue — 8 | Green — 11 | Olive or Blue tertiary = 24.- | |
| Yellow — 3 | | | |
| Blue — 8 | Purple — 13 | | |
| Red — 5 | | | |

The above also explains why the tertiaries are called red tertiary, blue tertiary &c. because into each tertiary, 2 equivalents of one primary enter; and only 1 equivalent of each of the other primaries. — In russet, for example, we find 2 equivalents of red, and 1 each of blue and yellow; and in olive 2 of blue, and 1 each of red and yellow, hence they are respectively the red and blue tertiaries. — In all these cases we have 8 eq: of Blue, 5 of Red. and 3 of yellow; only the mode of combination varies. — This variation may occur to any extent, provided the totals of each be always the equivalent proportions

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## Waterproofing cloth or artificial flies

Dissolve equal quantities of Alum and Sugar of Lead in water. Allow the precipitated sulphate of lead to settle; then pour off the clear liquid containing the acetate of Alumina, and immerse the cloth in it. (Field.)

## Carbolate of Glycerine

℞ Calvert's crystall: ~~glycerine 1 pt.~~ Carb. acid 1 pt. by weight
Glycerine ——— 6 pts. Mix
Can be diluted to any extent.—

## Cow's Milk

1 lb of cows milk contains

| | |
|---|---|
| Water | 333 grs. |
| Caseine | 350 grs |
| Butter | 245 grs |
| Sugar | 420 " |
| Mineral matter, phosphates, Sulphates, chlorides &c— | 70 |

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Cough Mixture. —

| | |
|---|---|
| Carbolic acid (Crystal.) | gr XXX |
| Glycerine | ℥ij |
| Tr: Orange peel | ℥ij |
| Water | ℥ viij ℔. |

2 drms will contain a little less than 1 drop of Carbolic acid. or 1gr: of the crystallized acid. —

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## Mixed Fabrics. —

The fibres of vegetables, such as cotton, hemp, flax, &c resist the action of caustic Alkalies, even when boiling, but are decomposed by the concentrated mineral acids. — But nitric acid when fuming, or when mixed with sulphuric acid does not dissolve vegetable fibre, but transforms it into pyroxiline, or gun cotton. — Vegetable fibres, when pure, have very little affinity with artificial coloring matters. On the contrary, Wool or silk — of animal origin — take dyes readily — Wool even without the addition of Caustics. —

To seperate vegetable fibres from wool or silk, boil the tissue in a solution of caustic soda. (100 pts water to 10 of concentrated solution of soda). — The solution will dissolve the wool and silk, and leave the vegetable fibre. —

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To discover wool in silk tissue; plunge the fabric in a cold bath of concentrated hydrochloric acid.— The silk will be dissolved and the wool and vegetable fibres left.—

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Carbolic Acid.—

This acid may be diluted by being shaken up with 20 parts of water.— It is neutralized by the alkalies, as well as lime, magnesia, and Glycerine.— The last combined with olive oil is its best antidote.—

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Chloralum.—

Will acidify ordinary sewage, and destroy its living organisms, when added in the proportion of 1 to 40.—

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Pincers.—(Mechanical powers.

This useful tool, consists of two levers of the first order.— To find the power of the grip: divide the length between the hinge pin and the ends, by the distance between the former and the jaws.— If the one is 6 times that of the other, the power of the grip will be six fold.—

To find the power of the pull:— divide the total length of the tool from the jaws to the

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ends, by the length between the jaw and that part of the shoulder which acts as the fulcrum. If the former is 8 times the latter, the power of the pull will be eightfold. –

It has been found that a threepenny brad 1¼ inch long, when hammered ½ inch into dry Christiana deal, required a force of 58 lbs to extract it. – But by using pincers we have 58 ÷ 8 = a trifle more than 7 lb to withdraw it. –

---

## The Screw. –

Sometimes the efficiency of the screw is diminished by friction to ¼ th its theoretical quantity, – and no more can be safely depended upon. –

To find the power of a screw: – first find the circumference of the circle the lever or wrench employed in turning it, describes through one revolution: which is done by doubling the length of the wrench (as it is only the radius) and saying as 7 : 22 :: double the length of the wrench. – Next, multiply this ascertained circumference by the number of threads in the inch. – This will give the number of inches the hand has to travel in order to raise the weight or resistance 1 inch; and hence the mechanical power of the screw, theoretically. –

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Suppose a bolt having 10 threads to the inch, is turned by a wrench 12 inches long. the hand must move in 1 revolution through a circumference of

$12 \times 2 = 24$. Now, As $7 : 22 :: 24 = 75.4$ inches. — And $75.4 \times 10$ (the threads in an inch) $= 754$ inches. — Hence in order to move the bolt 1 inch, the hand must move over 754 in. — This would be the power without friction. But it will be in reality reduced to one fourth of that or only 188

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To find what force it is necessary to exert with a given screw and wrench, in order to produce a given pressure. —

Find the theoretical power of the screw by the aforegoing rule. — Divide it by 4. Then divide the given pressure by the sum so obtained. —

Thus: what force exerted on the wrench will be required to draw two surfaces together with a force of 1 ton? — the screw having 10 threads to the inch, and the length of the wrench being 12 in. Now by the preceding rule we have found the real power of the screw to be 188; and $\frac{2240 \text{ lbs}}{188} = 11.9$ lbs. the force to be applied to the wrench. —

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## Golden rule of Mechanics -- or Law of Virtual velocities.

In any mechanical power, the distance through which the power moves, multiplied by its magnitude, is equal to the distance through which the resistance moves multiplied by its magnitude.

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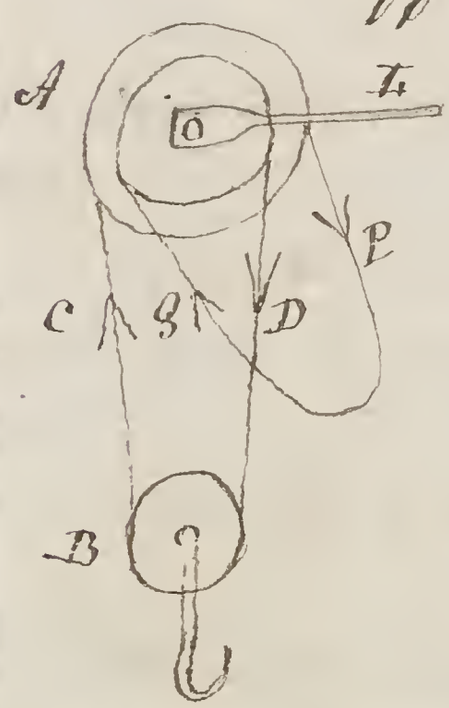
## The differential Pulley. -




This most useful appliance consists of a fixed and a movable block, and an endless chain. -- The upper block A consists of two sheaves in one piece, which turn together; -- One being a little larger than the other. -- The lower block B must have small ridges in its groove to grip the links of the chain properly. -- From P where the power is applied, the chain passes over the larger sheave, then down under the movable block B; then up again around the smaller sheave, and back again to P. --

The upper sheave winds up the chain on the side C, and at the same time lowers it on the side D, as indicated by the arrows. Now, as the groove

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by which the chain is raised is larger than that by which it is lowered, it follows that the chain must be wound in a little faster than it is lowered out; hence the block B must be gradually raised.— The raising of the load is thus due to the difference of these actions, hence the name.—

The velocity ratio is easily ascertained by measurement, which for weights up to a quarter of a ton is found to be 16; as 16 feet of chain is required to be pulled out of the upper block in order to raise the hook one foot.— But the mechanical efficiency is by no means sixteenfold, but not more than 6·6; as it is necessary to apply a power of 86 lbs to raise 5 cwt.—

In this machine the velocity ratio is observed to be 16, while the mechanical efficiency is only 6·6; hence the remaining 9·4 of the energy is consumed in friction, which expends itself in abrading the surfaces of the pullies, producing wear and tear, — to guard against which the working parts must be specially hardened.—

Now, in all cases in mechanics, where more than half of the applied power is lost in friction, this friction acts to prevent motion, hence

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this pulley does not overhaul; and when the weight has been raised, it will remain suspended without the chain being held or fastened, with the utmost safety. — This is one of its most useful properties. — When the weight has to be lowered, the chain Q must be pulled, just as the chain P must be pulled when it is being raised. — By holding these chains one in each hand, the position of the weight can be adjusted with the greatest nicety. —

The more nearly the two sheaves in the upper block A approach each other in size, the greater the power and the slower the operation, and vice versa. —

By applying a lever L to the axle of the upper block A, much greater power can exerted, but the process is comparatively slow. A man may thus easily raise a ton. —

---

## Cranes. —

Suppose a pinion of 20 teeth is moved by a 15 foot handle, making a circle of 3 feet diameter. — Let this turn a wheel of 200 teeth, on whose axle a a drum of 1 foot diam: is fixed. — To find the power requisite to move a certain weight, we must first ascertain the space through which the power must

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be applied by the principle of virtual velocities. When the barrel has made one revolution $\frac{22}{7} \times 1 = \frac{22}{7}$ feet of chain will be pulled out, or 3·143 nearly. But when the barrel has made one revolution, the wheel of 200 teeth must also have made one. But the pinion which gears into this wheel must have made 10 revolutions, because the wheel has 10 times more teeth than the pinion. – The handle attached to the pinion must also have made 10. – Now, the handle describes a circle 3 ft in diam: and therefore the space through which the power must be exerted is $3 \times \frac{22}{7}$ for one revolution, and therefore $30 \times \frac{22}{7}$ for 10 revolutions, or 93·14 feet. – Thus the virtual velocities of the power and the load are $\frac{22}{7}$ and $30 \times \frac{22}{7}$. – But by the principle of virtual velocities, the mechanical efficiency of the machine is the ratio of the virtual velocity. That is

$$\frac{30 \times \frac{22}{7}}{\frac{22}{7}} = 30$$

Hence the efficiency of this simple crane is thirty fold. That is if a man exert a pressure of 40 lb on the winch, he will be able to raise $40 \times 30 = 1200$ lb. –

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Double Crane. -

In powerful Cranes there are 3 wheels and 2 pinions. - And in all cases the mechanical efficiency may be found by the following rules. -

Multiply the diameter of the circle described by the handle into the product of the number of teeth in all the wheels successively. -

Multiply the diameter of the barrel by the number of teeth in all the pinions successively. -

The former of these products divided by the latter, gives the mechanical efficiency of the apparatus. -

Example, a crane with a handle 1½ ft. a barrel 1 ft diam: first pinion 12 teeth working into a wheel of 180 teeth, while on the axle of the latter is a pinion of 20 teeth working into a wheel of 200 teeth, which carries the barrel, what is its power? -

Now 1·5 (handle) × 2 = 3 diameter of circle described by handle, × by teeth of wheels, or 3 × 180 × 200 = 108000 And the product of the diameter of the barrel and the numbers of teeth in the pinions is 1 × 12 × 20 = 240 Hence the mechanical efficiency is $\frac{108000}{240} = 450$. -

In a crane of this kind a man can raise by exerting only 40lb × 450 = 18,000 lb. - The power of any crane is doubled by adding a movable block

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to the weight, when 1 man may lift 36,000 lb or more than 15 tons. - The power being nine-hundredfold. - The loss by friction in the crane is not more than $\frac{1}{4}$ th or $\frac{1}{5}$ th, hence it overhauls. -

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## Hydraulic Power

To find how many units of power a column of water in a pipe is capable of exerting. in closed pipes. -

Multiply the weight of the column of water in pounds, by the distance it descends, in feet. -

Example. What is the pressure exerted by a column of water 24 feet fall, in a 15 foot pipe? -

First find the area of the pipe, which is (radius$^2$) that is $6^2 \times 3{\cdot}143 = 254{\cdot}5$ area. Then multiply 254·5 by 288 (length of pipe in inches) = 73196·0 inches (total contents. Now, as 252·5 grains is the weight of cubic inch of water, $73196{\cdot}0 \times 252{\cdot}5 = 18481990$ grs. - And as 7040 grs = 1 lb $18481990 \div 7040 = 2625{\cdot}28$ lbs total weight of water in pipe. Hence $2625{\cdot}28 \times 24 = 63006{\cdot}72$ lbs, or 28·12 tons, which the weight of a pipe full of water

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of 1·5 foot diameter, and 24 feet in height, would be capable of lifting 1 foot high, in its descent through 24 feet: supposing the pipe to be kept constantly full. & 1 ton 28·128 feet.–

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## The Hammer.–

A taper nail has several resistances to over-come. First, to compress the fibres of the wood with a gradually increasing force, in order to make an entry. Second, friction against the sides of the hole; the amount of which may be estimated by the force required to withdraw it, when friction alone resists its withdrawal.– The relative amounts of these forces, it is not easy to determine.– In hard woods, the first is the most important.– While in soft woods, friction produces a larger share of the resistance. Both these forces must be overcome by the blows of the hammer.– When the hole is previously bored, no resistance occurs till the hole is filled.–

In order to measure the force necessary to drive a nail, we must find what weight must be quietly imposed upon its head in order to force it into the wood.– This force, in the case of hard wood, is enormous.– Consequently

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a blow of a hammer must be capable of exerting for an instant a force equal to a quiet continued pressure of many hundred weights: hence the hammer is a mechanical power, for it transforms the power of the hand into a much greater force; and this property of the hammer is entirely due to inertia. —

Action and reaction are equal and opposite. — When the hammer strikes the nail with a certain force, the nail resists the hammer with an equal force. This force depends on the amount of motion the nail loses. When it moves only a little deeper at each blow, the force is enormous. But if it moves freely, as in soft wood, the force is vastly reduced. — A rapidly moving body exerts a prodigious force of reaction upon any body which endeavours to stop it suddenly: but if it be stopped gradually, it exerts a much less force. —

Work or energy may be stored up in a moving body. — Thus a cannon ball moves through the energy imparted to it by the explosion. — This energy remains stored in it until it either

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gradually parts with it in overcoming the resist-
-ance of the atmosphere, or it suddenly meets
with a wall or other opposing body, when its
stored energy, or so much as remains of it, is
instantly transfered to the destruction of the
obstacle, and the ball having thus spent its
energy, comes to rest. - The work capable of
being performed by a ball, may at once be
realized, if we remember that it may be shot
perpendicularly into the air. - Thus, suppose
a ball of 100 lb weight ascends 1,000 feet,
it contained sufficient energy to accom-
-plish 100 × 1,000 = 100,000 foot pounds
of work. -

Whatever be the moving body, the way
to estimate the energy it contains, is to find
how high in the air its velocity would raise it.

If a body moves at a certain velocity, the
height to which it would ascend vertically, up-
wards at that velocity, is found by dividing
the square of that velocity by 64. - If, then, we
multiply that height by the weight of the body,
the product will be the units of work that
the body is capable of performing before it
comes to rest. -

Example what is the energy of a 300 lb shot

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moving at a velocity of 1200 feet a second
thus $1200^2 = \frac{1440000}{64} = 22,500$. or
4 miles and 500 yds: the height to which it would
ascend vertically, (independant of atmospheric
resistance.) And $22,500 \times 300 = 6,750,000$
units of work. — We find it will thus be capa-
-ble of moving 6,750,000 lbs through a space
of 1 foot; or 1 lb through a distance of 6,750,000
feet. Equal in the former instance to an impact
of 3013 tons through 1 foot of space. —
By the same rule, the impact of a 68 lb
shot will be 1,530,000; or a little more than
683 tons, upon its own area. —
Applying the same formula to the
hammer of 1 lb weight, supposing it to strike
the nail with a velocity of 20 feet a second,
we find it to contain 6·2 units of work. or
capable of raising 1 lb 6·2 feet high. — Suppose
then, that the nail is forced in to the wood
$\frac{1}{10}$ inch at each blow, the reaction of the nail
must consume and absorb the entire 6·2
units of force when the hammer moves through
$\frac{1}{10}$ inch. —
To find the weight a hammer then of 1 lb weight
would move through 1 foot of space, we have
6·2 lb expended upon each $\frac{1}{10}$ inch, and as there

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are 10 tenths in each inch, and 12 inches in a foot, we have the following Viz: 6·2 × 10 × 12 = 744 lb, or $\frac{1}{3}$ of a ton pressure on the head of the nail. – If the nail only Entered 0·05 inch at each blow, the impact would be double, or 1,488 lb. –

---

## Pile driver. –

In this form of hammer, a massive iron weight slides up and down in a frame. – Now if the monkey weighs 500 lb, and is raised 20 foot, the units of work it is capable of exerting is 500 × 20 = 10,000. – And it drives the pile 1 inch at each blow. Since there are 12 inches in a foot, we have 10,000 × 12 = 120,000. – Hence the pile is driven each inch by a force of 120,000 lbs. – or upwards of 50 tons. –

---

## Spectacles. –

The following are the proper focal lengths for different ages, in order to bring the near point of 8 inches back again. –

| years | focus | years | focus | yrs | focus |
|---|---|---|---|---|---|
| 40 – | 36 | 58 – | 18 | 75 – | 10 |
| 45 – | 30 | 60 – | 16 | 80 – | 9 |
| 50 – | 24 | 65 – | 14 | 85 – | 8 |
| 55 – | 20 | 70 – | 12 | 90 – | 7 |
| | | | | 100 – | 6 |

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## Strength of Girders.

Any beam which is supported at one or both ends in order to sustain a strain in any part of its length, is a girder.- The longer a beam is, the weaker it is, provided its section remain the same; consequently the break load of a beam varies inversely as its length.- A beam which is not square, is stronger edge ways than flat ways, in the proportion of the depth of the beam to its breadth.-

A beam of cast-iron 1 ft long, and 1 in: square in section, is broken by 1 ton load.-

To find the breaking strain of a cast iron beam. Multiply the breadth by the depth, (for the area) and that area again by the depth, and then by the numerical co-efficient of Cast iron which is 12, and divide the product by the length. All the dimensions must be expressed in inches, and the answer will be in tons.-

Example, what is the break load of a cast iron beam, 20 ft long, 6 in: deep, and 2 in broad 6 × 2 = 12 area of section. And 12 × 6 × 12 ÷ 240 = 3·6 tons.-

The above formula holds good for all other substances, the only difference being, to use the co-efficient number appropriate to each: which may be found in tables giving the comparative

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strengths of materials. —

Example, what is the breaking load of a beam of pine, 10ft long, and 6 in. square? —

Ans. $6 \times 6 = 36$. And $36 \times 6 \times 6{,}000 \div 120 = 10{,}800$ lbs. —

In the above cases the load is applied to the centre of the beam. But a beam is capable of sustaining a much greater weight when the load is distributed over several points of its length. And in the case of a beam supported at each end, and built over its entire length with masonry, where every inch of it has the same pressure to sustain, it will bear twice the weight. —

In large beams, their own weight forms a large portion of the strain, though distributed along the whole length; and the dimensions are limited, by the fact, that beyond a certain span, it would be impossible for them to sustain their own weight. — If the ends of a beam are securely fixed in masonry, so that its ends are prevented from curling up, it will sustain nearly double the weight. —

If a beam is fixed at one end only and a load applied to the free extremity, it is only $\frac{1}{4}$ the strength of the other fixed at both ends. —

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The break load of a slip of pine ½ in. square, and 10 in. long, is 80 lbs. –

---

## The Tilt hammer. –

The force of the blow is found by multiplying the weight of the hammer in pounds, by the height to which it is raised in feet. – Thus, if a hammer weighs 500 lbs. and it is allowed to descend 2 feet, we have 500 × 2 = 1,000 lbs. or units of work.


If then, the blow is compressed ½ inch at each blow, the whole 1,000 units of work must be expended by that ½ inch of compression. And as there are 24 half inches in 1 foot, the total force must be 24 × 1,000 = 24,000 units of work. in each blow. equal to more than the squeezing force of 10 tons quietly imposed upon it. –

---

## Fly Wheel

To find the amount of power stored in a fly wheel, (which is simply a reservoir of surplus force,) proceed as follows. –

The essay on the hammer explains that if a body of a certain number of pounds weight, or parts of a pound, be moving at a certain velocity, (which we shall call m and r respectively,)

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the number of foot pounds of force which have been employed to produce this velocity, and therefore the number of units of work it will give out before it comes to rest, is $m$ (weight of body) multiplied by $v^2$ (velocity squared) and divided by 64.—or $m\frac{v^2}{64}$.—We shall now apply this result to determine the number of units of work in a fly wheel.—

Let $n$ be the angular velocity of the fly wheel. The angular velocity of a body, is the number of angular units through which it turns in the unit of time.—Thus, if we say the angular velocity of a body is 3, what is meant is, that it turns through three times the angular unit in 1 second.—Now the angular unit is 206·265 seconds. And therefore when a body has an angular velocity of 3, it turns in 1 second through 206·265 × 3 seconds, and dividing this quantity by 60 × 60, we find the number of degrees it will move through in 1 second to be 1·7188.—

From the above, we see that if $R$ be the radius of the wheel, the actual velocity will be $nR$. of any point on its circumference.—

Let $m$ be the number of pounds in the rim.—Then the mass $m$ is moving with the velocity $nR$, and therefore the total quantity of work

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stored up in the wheel when revolving is — $m\frac{n^2R^2}{64}$. — Example. —

A fly wheel 12 feet diameter, whose rim weighs 4 tons, revolves 4 times in a minute. How many units of work will it contain? —

Since the wheel revolves once in 15" its angular velocity is $\frac{2\times 22}{15\times 7} = 0{\cdot}42$. — Therefore the velocity of the rim is $0{\cdot}42\times 6 = 2{\cdot}52$. — We have then a mass of 4 tons moving with a velocity 2·52 feet a second. — The quantity of work stored up is therefore $8960\times\left(\frac{2{\cdot}52}{64}\right)^2 = 889$. — Hence 889 units of force must be expended to set up this speed in the wheel, and a similar quantity must be given out before it can come to rest. —

The higher the velocity the greater the quantity of work; for the expression for the work is $m\frac{n^2R^2}{64}$ for this varies proportionally to $n^2$ — that is, to the square of the angular velocity. — Hence if we double the speed of the wheel, we quadruple the quantity of work it contains. — If the wheel we have been considering revolved 20 times a minute instead of 4 times, the quantity would be increased 25 fold, or $25\times 889 = 22225$ units. — Suppose a wheel 2 feet in diameter, whose rim weighs 2 cwt. and revolves 5 times a second. —

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The angular velocity is therefore $10 \times \frac{22}{7} = 31.4$.
Hence the quantity of work stored is $224 \frac{(31.4)^2}{64} = 3451$.- This wheel is therefore capable of raising a load of 3,451 lb through 1 foot before it comes to rest: or a pressure exceeding 2 tons, must be exerted through 1 foot in order to stop it.-

---

## Shearing Machine.-

The shearing machine is simply a lever of the first order, having a cutting edge at one end, while the longer arm is worked by an eccentric sheave fixed on the axle of a fly wheel.-

It has been found by experiment that a pressure of 20 tons is required to divide a bar of wrought iron 1 inch square across.- Which is about the same force as would be required to tear the bar across by extension; as in each case the same number of particles of iron have to be separated from each other. If the power of the lever is 6 fold, it will require its long arm to be pressed with a force of about 3 tons in order to divide the above bar.-

We shall also be able to estimate the number of units of work which will be absorbed from the fly wheel while dividing the bar of 1 inch square.-

A pressure of 20 tons = 44,800 lbs has to be exerted through not more than $\frac{1}{4}$th inch: as immedi-

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-ately after the cut commences, the iron must be completely divided across.- This force of 44.800 lbs has therefore only to be exerted through the space of $\frac{1}{48}^{th}$ of a foot; consequently the total units of work is, $\frac{1}{48} \times 44.800 = 933$ abstracted from the wheel at each operation.-

The Punching Machine is constructed precisely upon the same principle: the only difference being that short end of the lever is fitted with a punch which works into a socket, instead of shear jaws.-

---

## Steam.- Horse power.-

A horse power means the amount of work supposed to be capable of being accomplished by a horse, which is equal to a force able to raise 33,000 lbs to the height of 1 foot in 1 minute.-

To estimate the actual horse power of a steam Engine; ascertain the actual pressure in the cylinder, by means of a gauge or indicator,- and from this deduct 1½ lbs for loss by friction &c.- Then find the area of the piston in square inches, and multiply this by the pressure obtained, which will give the total pressure on the piston.- Now multiply the number of strokes in a minute by the length of each, expressed in feet, and we

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will find the space traversed by the piston in feet in 1 minute. Multiply this by the total pressure, and divide by 33,000, which will give the actual horse power.-

Note; a complete stroke of the piston includes both the upward and downward movement, but each movement is to be considered as a stroke in the calculation.-

Example. What is the actual horse power of an engine whose piston has an area of 200 square inches, and length of stroke 2 feet, 60 complete strokes a minute, and a pressure of 12 lbs to the sqr: inch?-

$200 \times 1\frac{1}{2} - 12 = 200 \times 10{\cdot}5 = 2,100$ lb total pressure on the piston: and the space traversed by the piston in 1 minute $60 \times 2 = 120 \times 2 = 240$.- The work accomplished therefore is $2100 \times 240 = 504,000$ foot pounds, and the horse power is $\frac{504,000}{33,000} =$ a little over 15.-

The nominal power is often as low as $\frac{1}{4}$ to $\frac{1}{8}$ of the actual power.-

## Admiralty formula for calculating Nominal horse power.-

Multiply the square of the diameter of the piston, by the space traversed by the piston in 1 minute; the former expressed in inches and the latter

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in feet, and divide by 6,000. —

Example. What is the nominal horse power of the aforesaid engine? —

Since the area is 200 sq: in: of the piston the diameter is about 16 in: Therefore

$$\frac{16 \times 16 \times 240}{6,000} = 10\tfrac{1}{4} \text{ nearly.} —$$

---

Power of Boilers. —

Since an engine of 1 horse power is capable of raising 33,000 lbs 1 foot high in 1 minute it will raise nearly 2,000,000 lbs to the same height in 1 hour. Now, since the evaporation of 1 cubic inch of water is capable of raising 1 ton a foot high; to raise the 2,000,000 lb to the same height will require the evaporation of 1,000 cubic inches of water. — A large portion of this power however is lost in moving the engine &c. —

The standard estimate, is, that a boiler should evaporate 1 cubic foot of water per hour for each horse power of the engine. —

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Bone and Phosphatic Manures. —

By boiling, bones lose nearly all their fatty, and a portion of their gelatinous matter

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|---|---|---|---|---|---|

when kept a few months after boiling. The following is about the average composition of boiled bones.

## Boiled Bones

| | |
|---|---|
| Moisture | 10 |
| Organic matter | 28 |
| Tribasic Phosphate Lime (Bone Phosphate) | 54 |
| Phosphate Magnesia | 2 |
| Carbonate Lime | 4 |
| Alkaline Chlorides and Sulphates | 1 |
| Insoluble matter | 1 |
| | 100 |

Fresh or green bones often contain half their weight of water.—Dry bones are better than sheep bones, and the latter than horse bones, for manurial purposes.—Bones contain on an average from 2·5 to 3·7 per cent of Nitrogen. During their decay in the soil, the nitrogen is chiefly converted into Ammonia: 14 parts of nitrogen combining with 3 of hydrogen to form 17 parts of Ammonia.—It is easy then to find how much Ammonia a given quantity of nitrogen will form by Rule of Three. Say as 14 : 17 :: the given amount of nitrogen. In the amount of nitrogen above quoted As 14 : 17 :: 2·5. Ans $\frac{17 \times 2·5}{14} = 3·36$ nearly of Ammonia.—

And As 14 : 17 :: 3·7. Ans $\frac{17 \times 3·7}{14} = 4·49$

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Therefore the average amount of Ammonia furnished by Commercial bone dust will be from 3·36 to 4·49: but it occasionally attains to 5 per cent. — Nitrogen can only be assimilated by plants from its combination with oxygen or hydrogen in the form of Nitric acid or Ammonia. — The adulterations of bone dust, are generally Gypsum, Coprolites ground, Marl, sand or earth, and the plaster of old walls. — Lumps of bone remain in the soil very many years before decomposition, while their phosphates are readily soluble in water containing free carbonic acid, — with which the moisture of the soil is always more or less saturated, — when reduced to fine powder. — And it matters little whether they are pulverized by means of Grindstones, Sulphuric acid, or by fermentation provided they are reduced to a fine state of division; for this is the sole benefit to be obtained by dissolution with sulphuric acid. —

Fermented Bones have been found to be equal to dissolved bones as a manure, provided their structure is completely broken down. The only drawback being, that most of the organic matter including the nitrogen is dissipated and lost, unless special arrangements are

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continued to fix and retain the latter. - In order to avoid this waste as much as possible, the bones should be mixed with half their weight of earth to which is added 2 or 3 cwt of ground Gypsum for each ton of bones, then piled into a conical heap covered over with the mixed earth and Gypsum, and saturated from time to time with human urine, or other strong liquid manure. - In about 3 or 4 weeks, the bones will be found quite softened and crumbling down. -

High pressure steam helps materially the easy disintegration of bones. -

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Bone ash. - South American bone ash usually contains from 68 to 76 per cent of Tricalcic Phosphate. - The average is 71 p. c. -

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Dissolved Bones. -

In 1840 Baron Von Liebig suggested this improved method of treating bones, which was soon after carried into effect by Mr Lawes of Rothamstead. - Bones dissolve slowly in the soil, because their constituents are in a hard and firmly coherent state, and the earthy elements are for a long time protected from the solvent action of the moisture of the soil by the gelatinous membrane in which they

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are included, and which is itself capable of resisting decomposition for a lengthened period, especially if in large lumps. — But by exposing them to the action of sulphuric acid, or fermentation as we have seen, the membranous portion is broken down and destroyed, while the earthy phosphates are at once liberated in a fine state of division, ready to be assimilated by plants. — By the acid process, the phosphates are decomposed and a large portion rendered at once soluble in water; but as we shall see, this is of no material benefit, and the grand object is to place the phosphates in the soil in such a state of fine division as to be immediately acted on by its natural solvents. —

The action of sulphuric acid on bones is as follows. — Phosphate of Lime exists in bones as a tribasic Phosphate. That is, three atoms of lime exist in combination with one of phosphoric acid. This form of phosphate is quite insoluble in pure water, but slightly soluble in water containing free carbonic acid, ammoniacal salts, and even common salt. — That is, it requires a pretty large quantity of water so charged to dissolve it completely. — The natural moisture of the soil contains one or

Tribasic Phosphate of Lime $3CaO, PO_5$ —

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other, if not all three of these ingredients; so that it is quite capable of slowly dissolving tribasic phosphate, provided it is in a sufficiently fine state of division. Of course the finer the particles, the more readily and quickly are they dissolved. — Now, when two parts of sulphuric acid are added to one part of tribasic phosphate, the latter parts with two of its atoms of lime (which are replaced by 2 equivalents of water) to the acid; The remaining atom (the 2 atoms of water) of lime and the atom of phosphoric acid (what is properly called / but is really tribasic) constituting monobasic phosphate, commonly called biphosphate of lime, which is readily soluble in water: While the two atoms of lime seperated from the tribasic phosphate by the action of the acid, combine with two atoms of sulphuric acid to form two atoms of sulphate of lime or gypsum.

Tribasic phosphate, as we have seen, is insoluble in pure water, while monobasic phosphate is readily soluble in that liquid. Nevertheless, plants do not absorb monobasic phosphate from the soil, for if they did, it would fatally corrode their tender tissues. — Now, it is worthy of mark, that the instant monobasic or soluble phosphate of lime comes in contact with soil which contains any lime in any form, except

* formula $CaO, 2HO, +PO_5$.

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that of phosphate, natural or applied, the lime in the latter immediately combines with the soluble monobasic phosphate, and converts it again into the same insoluble tribasic phosphate it was before the action of the acid. — It may be reasonably asked, what is the benefit of submitting bones to the action of acid at all, when the soluble phosphate is again rendered insoluble the moment it touches the soil. — The answer is, simply that the bone phosphate may be got into the finest possible state of division; and this is the sole benefit. — It is our opinion, that a similar if not equal result may be obtained by due fermentation: — while the use of bone meal ground to a fine powder, will not only enable us to dispense with the expense attending the treatment with acid, or the loss and dissipation of organic and nitrogenous matters involved in the fermentative process, but at the same time present the bony matter in a sufficiently fine state of disintegration to be readily acted on by the natural solvents of the soil, and thus preserve the entire constituents of the bone for the benefit of the crop. —

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Tribasic phosphate consists of in 100 of
Lime ——————— 53·86
Phosphoric acid —— 46·14
According to Berzelius, when derived from bones after ignition, in 100 of
Lime ——— —— 51·26
Phosphoric acid —— 48·74
It requires 156 parts of tribasic phosphate to produce 100 of monobasic. — Every part of bisphosphate is therefore equal as a manure to 1·56* of bone earth made soluble. —

The following is the average composition of 100 parts of boiled bones acted on by 35 parts of known sulphuric acid, well mixed, and allowed to remain 1 month. —

| | |
|---|---|
| Water ——————————— | 16·0 |
| Organic matter and combined water | 20·0 |
| containing nitrogen equal to Ammo: —— | 2·0 |
| Bisphosphate Lime ——————— | 18·0 |
| Equal to bone phos: made soluble —— | 28·0 |
| Phosphate Lime ——————— | 8·0 |
| Gypsum ——————————— | 35·0 |
| Alkaline salts ——————— | 1·5 |
| Insoluble Matters ——————— | 1·5 |
| | 100·0 |

* See page 78.

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This manure will require to be dried with dry Earth, peat mould, or dry clay. —

1 ton of bone ash acted upon by 18 cwt of brown acid, will produce about 38 per cent of soluble (not biphosphates) phosphate

The chief minerals furnishing large percentages of phosphates of lime, are, Phosphorite, containing upwards of 70 p. c. — It is a white hard stone. — Apatite consits of 3 parts of tribasic phosph.ᵉ with 1 each of chloride and fluoride of lime. It is white. The green mineral called moroxite has a similar composition. — Coprolites erroneously though to be the excreta of fishes fossilized, contain from 50 to 60 p. c. — But all these mineral phosphs are so thoroughly indurated and lapidified, that they are practically insoluble and inert so far as regards a quickly growing crop; although they will be doubtless more or less slowly acted upon by the moisture of the soil, and may thus contribute a gradual supply of phosphates to grass lands for a very prolonged period. — Phosphate of Alumina is likely presently to be largely employed in the production of manures. by decomposing it with lime, whereby the resulting products are phosphate of lime and alum. — Native Phosphate of Alu-

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-nina contains phosphoric acid equal to nearly 70 p. c. of tribasic phosphate.

Preperation of Mineral Phosphates.

Mineral superphosphates are prepared by pouring Sulphuric acid (of Specific Gravity from 1·6 to 1·7) on ground Coprolites or phos-phorite, in the proportion of 8 per cent of acid for every 10 per cent of earthy phosphate, and 1 per cent of acid for every 1 per cent of Carbon-ate of lime. - It must be wholly converted into soluble phosphate, as any undecomposed portion remaining is entirely useless. - The super-phosphate thus made is always found in a hard mass, and must be broken up with a pick or spade. - In Manure manufactories, a machine called a disintegrator is used for this purpose. - On a small scale, superphos-phate may be made in a wooden tank 12 ft long, 5 ft wide, and 2 ft deep, internally coated with pitch to protect it from the acid.

Biphosphate of lime is of equal value as a manure from whatever source it may be derived; as it is precisely the same chemical substance: - The grand object is then to ob-tain it from the cheapest source. - It can be

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obtained from Coprolites at a cost of £6 a ton; from Bones £8.10/-; from phosphatic Guanos £9.15/-.— Recollect, this refers to pure monobasic, or soluble biphosphate of lime.—

The whole amount of insoluble tribasic phosphate which it may be considered desirable to apply, ought for reasons before explained, to be obtained either from bone ash, or phosphatic Guanos. From the former at a cost of £10 a ton; and from the latter at from £13 to £15 a ton.—This also refers to pure tribasic phosphate alone.—

The cheapest and most reliable source of Ammonia, is the Sulphate of Ammonia, which costs from £16 to £18 a ton.—Thus furnishing pure ammonia at £80 a ton.—

Farmers would act wisely if they bought their ammonia in the form of Sulphate of Ammonia, their soluble phosphate as mineral superphosphate containing 30 per cent of biphosphate, and their insoluble phosphate in the form of Bone meal, or ground bone ash.

| Manurial Mixture.— | cwt |
|---|---|
| Sulphate of Ammonia — — — — — | 1 |
| Bone meal or fermented bones — — | 4 |
| Concentrated mineral Superphosphate — | 15 |
| | 20 cwt |

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This compound contains p. Cent
Soluble phosphate ____ 23
Bone insoluble Phosphate ___ 10
Ammonia ____ 2
and will cost less than £7 a ton.

Money value of Manures £ s: ton
Ammonia ____ £100 to 80, 85
Biphosphate of lime £17 to 20 to 30 G or B.
Insoluble Phosphate of lime 12 " 10
Sulphate of lime ____ 1 " 10/-
Alkaline salts ____ 2
Potash Salts ____ 16
Organic matter ____ 0 " 10

To compute the value of a manure by this table, the 100 parts of the analysis is to be regarded as 100 tons. - The amount or per centage of each ingredient is multiplied by its price per ton standing against it in the table, all these products are added together give the value of 100 tons, and consequently the result divided by 100 will give the value of 1 ton. - Suppose a manure contains 1 p.c. Ammonia, 20 p.c. of biphosphate, and 5·5 of insoluble phosphate.

| | | £ |
|---|---|---|
| 1 ton of Ammonia at £80 | ____ | = 80 |
| 20 " Biphosphate - 30 | ____ | = 600 |
| 5·5 Insoluble phos: 10 | ____ | 55 |
| | | £ 735 |

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Now £735 divided by 100 = £7.7/-

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※ To find how much bone phosphate made soluble is equal to a given quantity of soluble phosphate.— Since it requires 1·56 parts of bone earth to form 1 part of soluble phosphate, we have simply to multiply the given percent by 1·56.— Example, how much bone phosphate is equal to 20·0 p.c of Soluble phosphate? Now 1·56 × 20 = 31·20. of Phosphate made soluble.—

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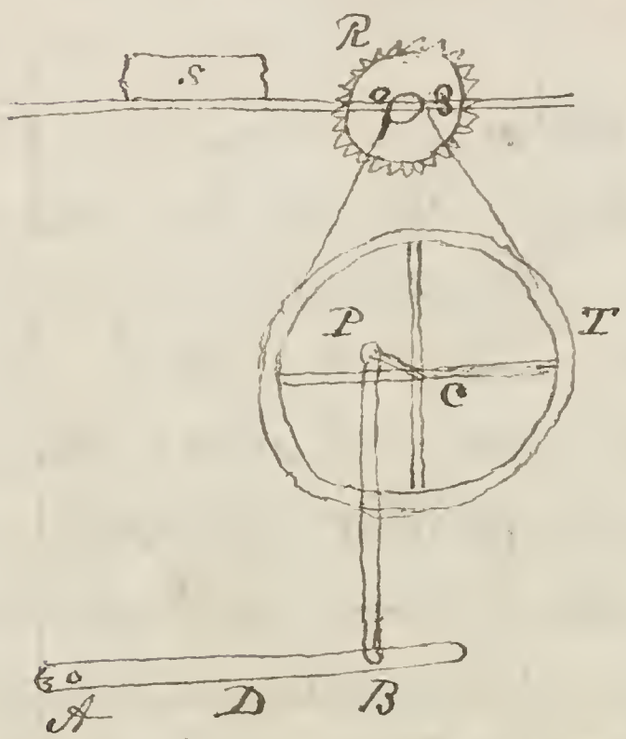
Circular saw.




CT is a fly wheel which drives the saw by the band. A B the treadle. C P the crank. B P connecting rod between treadle and crank. O the sheave which drives the saw. R the saw. S the block to be sawn.— Let A B be 2 feet long. The pressure of the foot applied at D 30 lbs.— The crank (C P) 2 inches long. The diameter of fly wheel 20

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inches; of the sheave (O) 2 inches. — And of the saw 8 inches. —

The point B oscillates through a space double the length of the crank, or $2 \times 2 = 4$ inches. — D the foot-point moves only through half the distance of B, or $4 \div 2 = 2$ inches. — Hence at each revolution of the fly wheel, the foot pressure = 30 lbs is applied through a space of 2 inches, and therefore $30 \times \frac{1}{6}$ = 5 units of work are imparted to the wheel at each revolution

The circumference of the saw is 7 : 22 :: 8 = 25·14. and since it makes 10 revolutions for every revolution of the fly wheel, it follows that the edge of the saw will move through 250 inches, while the power at D has only moved through 2 inches. — Hence the magnitude of the pressure which the margin of the saw is capable of exerting is $\frac{30}{250} = 0{\cdot}12$ lbs. or nearly 2 ounces. —

If the fly wheel revolves once in a second, the margin of the saw will travel over 250 inches a second, or 1250 feet a minute. — Suppose the wood is cut at the rate of 1 foot a minute, then each revolution of the saw will have to cut about $\frac{1}{100}$ of an inch. — If the saw contains 50 teeth, and since each revolution has to cut $\frac{1}{100}$ inch, it follows that each tooth has only to cut $\frac{1}{5000}$ inch deep. —

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## Leaf Propagation

A large class of plants may be easily and expeditiously propagated by leaves alone. Perhaps under favourable circumstances every true leaf is capable of giving birth to a plant. It is a common pastime with young Gardeners to persuade a Pelargonium to throw out roots from a leaf.-

September is the best season for leaf propagation, though it may be practiced at any time. Only such leaves as are quite matured and ready to part from the stem by a touch, but previous to becoming withered, will succeed.- This generally occurs when the plants are in flower.-

The following plants readily propogate from mature leaves.- Crassulas, Echeveria metallica, Pachyphytum bractâtum, Coleus, Begonia, &c.-

The modus operandi, is simply filling a well drained pot with sandy loam, and pressing the soil firm where the leaf has to be fixed. The petiole or leaf stalk is then inserted in the mould up to the base of the leaf, and pressed firm, while a small wooden peg is fixed through it to keep all steady, and the pot placed in the moist atmosphere of a greenhouse.-

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The grand point is to maintain the leaf in a moderately moist condition, never wet and never dry. – It is better to bury a small portion of the base of the leaf beneath the surface of the sand. – Perhaps a tumbler glass inverted over the leaf will assist to keep it from withering. While heat will hasten the process. –

This is the easiest way of propagating the Coleus, whose leaf whether placed in sand or water will throw out roots in the course of a few hours, and in a few days a plant rises from the granulations from which the roots proceed. – The heat of a stove or intermediate house is of course required for this.

---

## Soluble Glass. –

and water glass are names given to soluble silicate of Soda, which in contact with Lime consolidates, and is partly converted into Silicate of Lime. Silicate of Soda, not only consolidates, but combines with porous sandstone or limestone. – Soluble glass is obtained by melting in a crucible of plumbago, 10 parts of Potash, 15 pts of pulverized Quartz, and 1 of charcoal. – When melted, the glass is cast, afterwards

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pulverized and treated with 4 or 5 times its weight of boiling water.- This solution dries rapidly after being applied to Stonework.-

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## To drill holes in Glass.-

A steel drill of good quality, well hardened will perforate glass easily.- Should the tool get blunt, a little Emery and a drop of oil will enable it to finish the job.- Or if oil and Emery are used a copper drill will effect the object.-

---

## Glass, a test for Metals

No test is so delicate for many metals, as a fused head of flint glass.- It will detect iron when the most careful analysis fails.- Wedgewood found $\frac{1}{20,000}$ of gold tinted it of a rose colour.-

---

## Tempering of Steel

When steel is heated to full redness - a higher heat will burn it - and cooled as suddenly as possible in cold water, oil, or Mercury; it will have attained its maximum degree of hardness and brittleness.- If, on the contrary, it be cooled very

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gradually, it will attain its maximum soft-ness. — Between those extremes any degree of hardness may be obtained by tempering. — If a piece of steel is hardened to its maximum extent, and afterwards reheated to a certain degree and suffered to cool gradually, it will be softened precisely to the degree to which it has been reheated. — The exact degree of softness is unerringly evinced by the different colours a piece of steel assumes at different temperatures. First, it becomes a pale yellow or straw colour, — the highest and hardest temper for surgical instruments, drills &c — at 430° to 450° the melting heat of 7 to 7½ parts of lead with 1 tin. Second, orange, at 470° to 490° for wood cutting or the melting heat of 5 to 7 pts of lead to 2 tin. Third, by a beautiful gradation of tint to a rich purple, for ~~saws etc~~ large cutting tools at 510° to 530°. — Fourth, to a deep blue, for springs &c. at 550° the melting point of 12 pts of lead to 1 of tin. — Fifth, a pale blue for axes ordinary saws &c at 560° to 600° the latter the heat of boiling linseed oil. — The tempering is most accurately obtained by immersing the article previously hardened to the maximum in one of these metallic baths just kept in a state of fusion. — It is rather singular

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that if the heat is carried beyond 600°, the colour, which was last a pale blue, will fade away entirely, and the metal will again become white, the next stage being a red heat. If the heating be arrested at any one of these stages, the temper will correspond to that stage. No subsequent reheating will alter this temper, though repeated again and again, provided it does not exceed the point it has attained previously thus a piece of steel may be tempered to a purple, and afterwards brightened and brought to a purple again without injury; but if it be heated till it becomes blue, its temper will be reduced to that extent.

---

Case-hardening Iron.—

A thin surface of steel can be given to iron by a process called "case-hardening".— The article is heated to bright redness, and sprinkled over with powdered prussiate of Potash

Another.—

Coat the iron while cold with a thin paste of Prussiate of Potash mixed with a little clay,—and when dry, raise the metal to a white heat, and then when it has

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cooled down again to a red heat, plunge it in cold water. - The carbon and Nitrogen of the cyanogen combine with the surface of the iron, converting it into steel. - Nitrogen seems to play some important though unknown part in the formation of steel, as iron may be heated in the presence of Carbon for any length of time, without being converted into steel, if the air is excluded: Neither will conversion take place in an atmosphere of the hydrocarbons alone. - Yet the quantity of Nitrogen in steel is too minute to be estimated with certainty by analysis. -

---

## Mixture for Inflamation in Cows

### Black Oil.

| | |
|---|---|
| Linseed Oil | 1 pint |
| Sulphuric acid | 2 Oz |
| Spt. Turpentine | 4 Oz |
| Oil Origanum | 1 Oz |
| Tinct. Myrrh Comp. | 4 Oz |

Pour 2 Oz into the womb after Lambing. -

Mix the Sulphuric acid with the oil in small portions at a time, stirring each portion thoroughly together before a fresh quantity is added, and when the whole is mixed in,

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continue the stirring until the acid is completely incorporated with the oil, when the other ingredients may be added, and also stirred in.— Considerable heat will be evolved, and the mixture will become nearly black.—

---

## Voltaic Coil.—

The primary coil generally consists of 100 feet of No 16 guage covered copper wire; and the secondary has often as much as from 300 to 500 feet of No 22 or 24 wire

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## Rhumkorff's Coil.—

In this coil, the secondary coil extends to several thousand feet of Extremely fine wire;— Each layer of which is insulated from the other by a thin sheet of Gutta Percha or other non conductor. (Oiled silk would likely answer for a small coil) It has, besides this arrangement, a Condenser, consisting of a large sheet of tinfoil enclosed in sheets of oiled silk, attached to the primary coil, which has the effect of increasing the intensity of the secondary coil, by increasing the

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quantity of the primary one.—(I suppose the condenser to consist of the tin foil rolled into a cylinder between two sheets of oiled silk, and introduced into the core in place of a bundle of wires, or otherwise interposed between the layers of the primary coil.)—Which way, is not stated, but the cut in the work shows a core in the coil.—

---

## Gunpowder Explosive force of.

Hutton found that the gasses disengaged from a given quantity of gunpowder, when confined in the space as occupied by the powder, and at an ordinary temperature, exert a force equal to 250 times the pressure of the atmosphere; or 1.050 lbs per square inch.—It is now estimated that the heat of ignited powder is twice that of red hot iron, and that this temperature increases the expansive force of these gasses about 8 times; or 8,400 lbs per sq: inch, when duly confined.—

Gunpowder expands during explosion at the rate of 3,000 feet per second

Greener.—

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## Tonic for Nervousness.-

½ Oz Gentian Root
½ Oz Valerian Do
¼ Oz Carbonate of Soda.- Boil the Gentian, valerian, & Soda together in 1 Quart of water down to 1 pint, and when cold add
¼ Oz Sal Volatile.-
Dose 1 wine glassful twice a day.

Dr. Charlton to Mrs Henry.-

---

## Infusion of Hops.-

Infuse Hops 60z. in 1 pint of boiling water for 4 hours. then strain. Dose half a wine glass. An excellent tonic.-

---

## Mahogony Stain.-

Logwood 2 Oz: Madder 8 Oz: Justic 1 Oz: Boil 2 hours in 1 Gallon water, and apply several times to the wood while hot. When dry, slightly brush over with pearl ash 1 Oz: water 1 Qt. polish off with wax or oil tinged with Alkanet.-

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## Bottle wax. –

Black: Black resin 6½ lbs. Bees wax ½ lb. Ivory black 1½ lb. Melt all together.
Red: – As above, with Venetian Red, or Redd Lead in place of Ivory Black. –

---

## Gilders Pickle

Alum & common Salt, each 1oz. Nitre 2oz. water 4oz: Imparts a fine colour to gold surfaces. –

---

## To smooth Varnished articles

If varnished surfaces are rubbed with Tripoli powder and water spread on flannel: and finally with suet and fine flour, they may be made as smooth as French polish. –

---

## Right Ascension.

When the Sun is Exactly on the Equator or the 21st or 22d March, a Line drawn from the centre of the Earth through the centre of the sun and produced into space, would strike a point named the first point of Aries: which is the Zero or starting point of the circle of the Zodiac: on which the degrees & hours are counted towards the left. – On the 21st March at noon, the first point of Aries will be due South; as also on the

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21st Sept. at Midnight.—

To find the 1st point of Aries:—Trace a line from the Pole Star through β Cassiopeae and Alpheratz, and we have nearly the 1st point of Aries.—

Now the distance of any heavenly body counted in degrees towards the left of this point, is called its "right Ascension".—

As the Earth accomplies 24 hours in completing a revolution on its axis, and as 360° compose a circle it is evident 15° will be passed through in 1 hour, hence Astronomers as often give the right ascension in hours and minutes as in degrees, which may be easily converted into degrees, by multiplying the hours by 15, and adding the number of degrees corresponding to the minutes to the sum.—

To find the line of 180° Right Ascension: From the Pole Star trace a line through a point between the middle star of the Great Bear and the star nearest the pointers (γ Ursae Majoris), and continue this line onwards, and it will represent 180° or a continuation of the zero line of Aries: only on the opposite side of the pole.—

Another line traced through the pole at right angles to the above will give the position of 6 hours or 90° and 18 hours or 270° respectively.—

We can now easily find the position of any

As in Lat: 55½°, the equator will be elevated 34½° above the plane of the horizon, we must subtract 34° 30' from all hights of stars on the north of the equator, as found by the quadrant. For Stars of S.D. subtract their height from 34½°

heavenly body whose A.R. is given, by dividing the space between each of those main lines or Quarters into 6 parts.

The A.R. of a heavenly body thus answers to the longitude of a terrestrial one, - but to find it readily we must also know its latitude from the Equator, called in this case its "Declination". -

## Declination

Means the angular distance of celestial body from the Equator, either north or south. -

## Polar distance

Is the distance of a heavenly body in degrees from either pole, and is found by subtracting its Declination in degrees from 90°. -

Position of a few principal Stars. -

| | | R.A. in hours h. | m. | | Dc. in ° deg. | m. | |
|---|---|---|---|---|---|---|---|
| α | Andromedae | 0 | 1 | — | 28 | 30 | N. |
| γ | Pegasi | 0 | 6 | — | 14 | 25 | " |
| α | Cassiopeae | 0 | 32 | — | 55 | 47 | " |
| α | Arietis | 1 | 59 | — | 22 | 49 | " |
| α | Persei | 3 | 14 | — | 49 | 22 | " |
| | Aldebaran | 4 | 28 | — | 16 | 13 | " |
| | Capella | 5 | 6 | — | 45 | 51 | " |
| | Sirius | 6 | 39 | — | 16 | 31 | " |
| | Procyon | 7 | 32 | — | 5 | 34 | " |
| | Regulus | 10 | 1 | — | 12 | 37 | " |
| α | Ursae Majoris | 10 | 53 | | 62 | 29 | " |

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|---|---|---|---|---|---|
| | R.A. in hours | | | | Dc. |
| | h. | m | | d. | m |
| Spica | 13 | 18 | — | 10 | 27 S. |
| Arcturus | 14 | 9 | — | 19 | 53 N. |
| a Coronae Borealis | 15 | 28 | — | 27 | 10 N. |
| Vega | 18 | 32 | — | 38 | 39 N. |
| Altair | 19 | 44 | — | 8 | 30 N. |
| a Cygni | 20 | 36 | — | 44 | 47 N. |
| Markab | 22 | 57 | — | 14 | 28 N. |

The position of Comet or other celestial body may be approximately found when its R.A. and Dc. are given by a reference to the above list.—

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## Position of a few fixed Stars.

First find Orion's belt. The 3 well known stars of which point nearly to Sirius on the east, and to Aldebaran on the right or west and a little to the north of this line.—Polar distance of Aldebaran 73° 47'.—In the month of December, this star will be in the South East about 9 P.M. and not far above the horizon:—being about 7° nearer the horizon, than mid-way between that and the Zenith.—Orion's Belt will be found in the South East part of the heavens.

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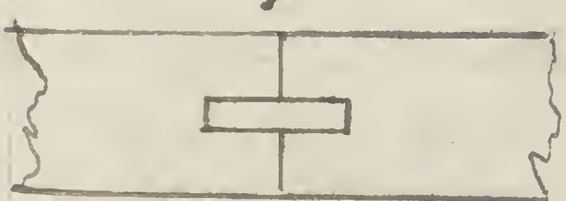
In the month of December, some of the most beautiful groups of stars are visible, viz: Orion's belt, with Betelgeux above, Rigel below, and Bellatrix on the North-east; Aldebaran and the Pleiades on the west; the brilliant Sirius on the east of the west; Capella high up North of Aldebaran, while Castor & Pollux are east of Capella; Algole, Alamak, Mirach, and Alpharet streaking out westward of Capella; Cassiopea in the west, high up; the Great Bear in the east.

## Joints used in Carpentry

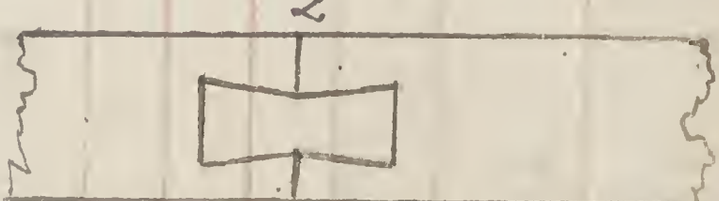
1



Groove & Slip Feather

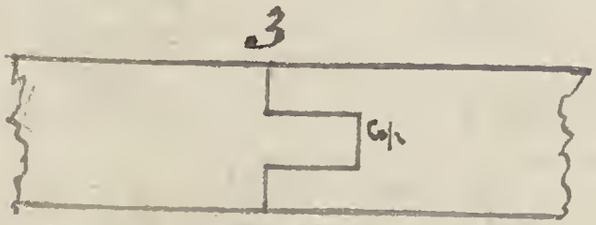
The groove is never more than $\frac{1}{3}$ the thickness of the board in width.—

2



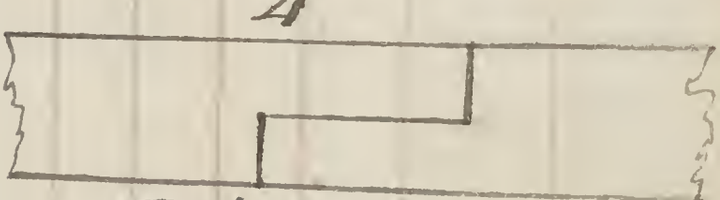
Dovetail Groove & Feather.

3



Tongue & Groove.—

4



Rebate.—

In planing strips of wood too thin to bear the plane, fasten the near end with a

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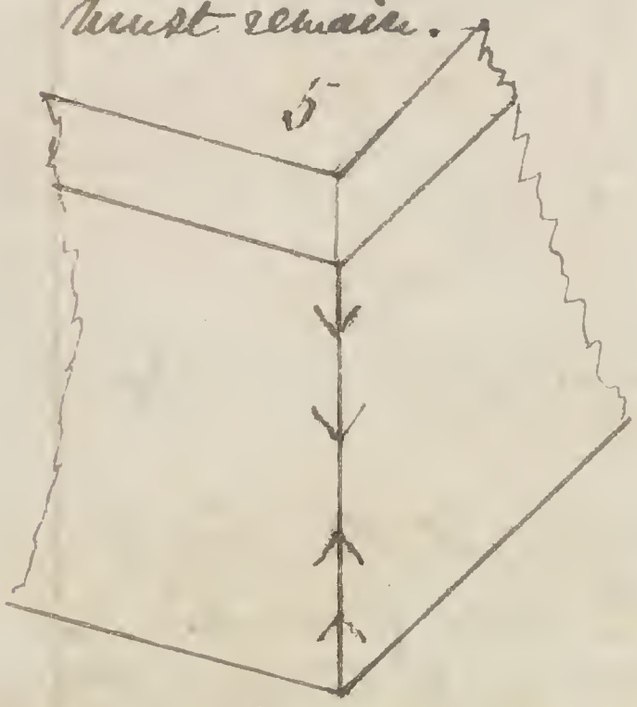
tack, and plane from it. —

A thin even coat of glue must be laid on with a brush, the pieces applied to each other, and if possible rubbed together two or three times, to ensure the equal distribution of the glue, and expel the air: and the thinner the layer of glue the stronger the joint. — The chief function of the glue being to exclude the air from between the surfaces of the wood. — In gluing soft wood, a piece of chalk should be rubbed over the surfaces before applying the glue; but not gritty particles must remain.




Keying.

A useful joint for light work. — The bevel of the two edges to be joined must be 45°. — Glue them together, and when dry saw 3 or 4 kerfs diagonally across the joint half of the kerfs inclining up, and half down. Cut some thin pieces of wood to fit these kerfs tightly, dip them in glue, hammer them in; and when dry, cut them off by the surface. —

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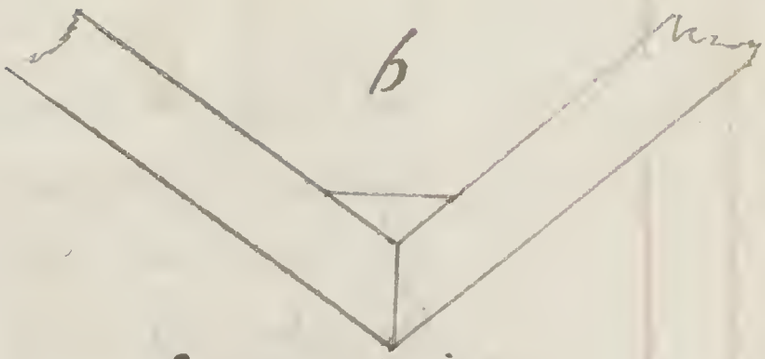
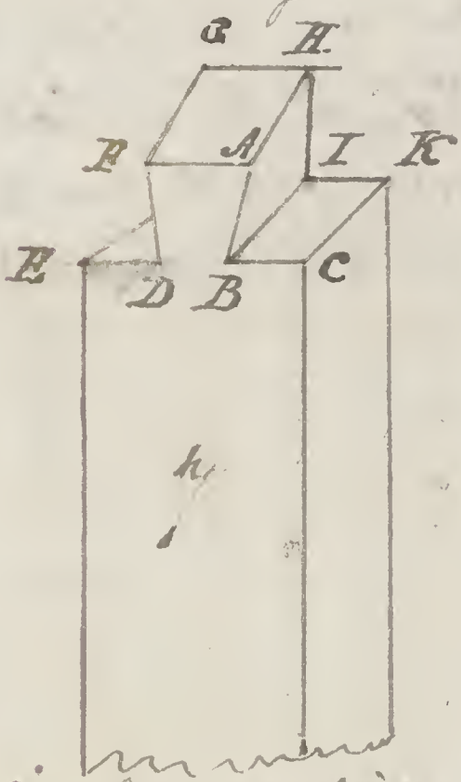


6

Corner piecing

In this the edges are bevelled the same as before. but when glued together, instead of using kerfs. to keep them together, a tri-angular piece is put inside. — It is neat, but not strong. —

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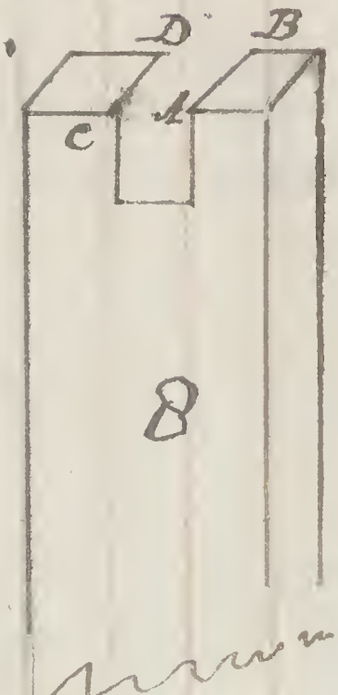
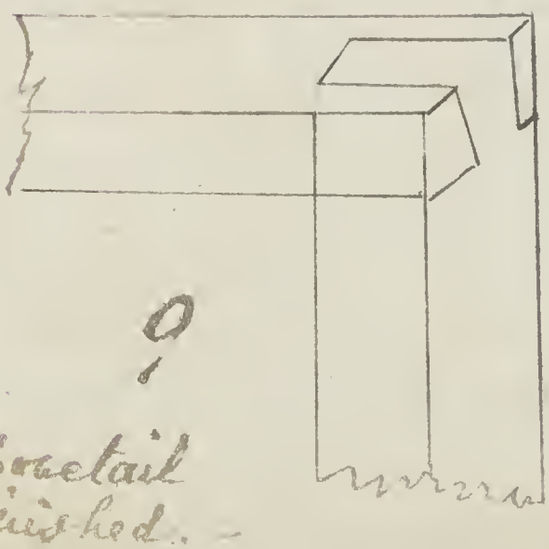



8

Single Dovetail — Pin & Socket.



9

Dovetail finished. —

Direct the side E C for the base of the pin D B. — and make the lines E D and A B 70° or 80° to the line E C. — The pin being made, lay it on the socket piece, and with a sharp point or pencil mark it out

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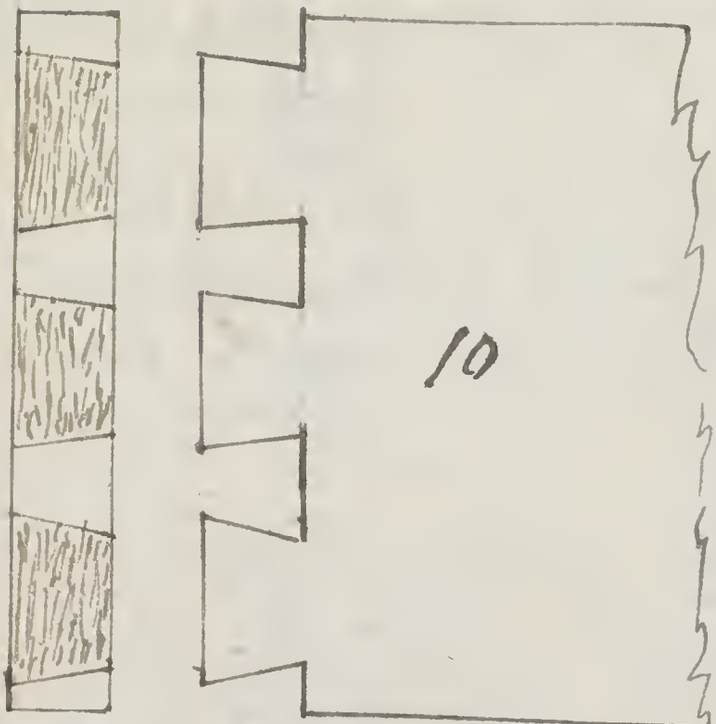
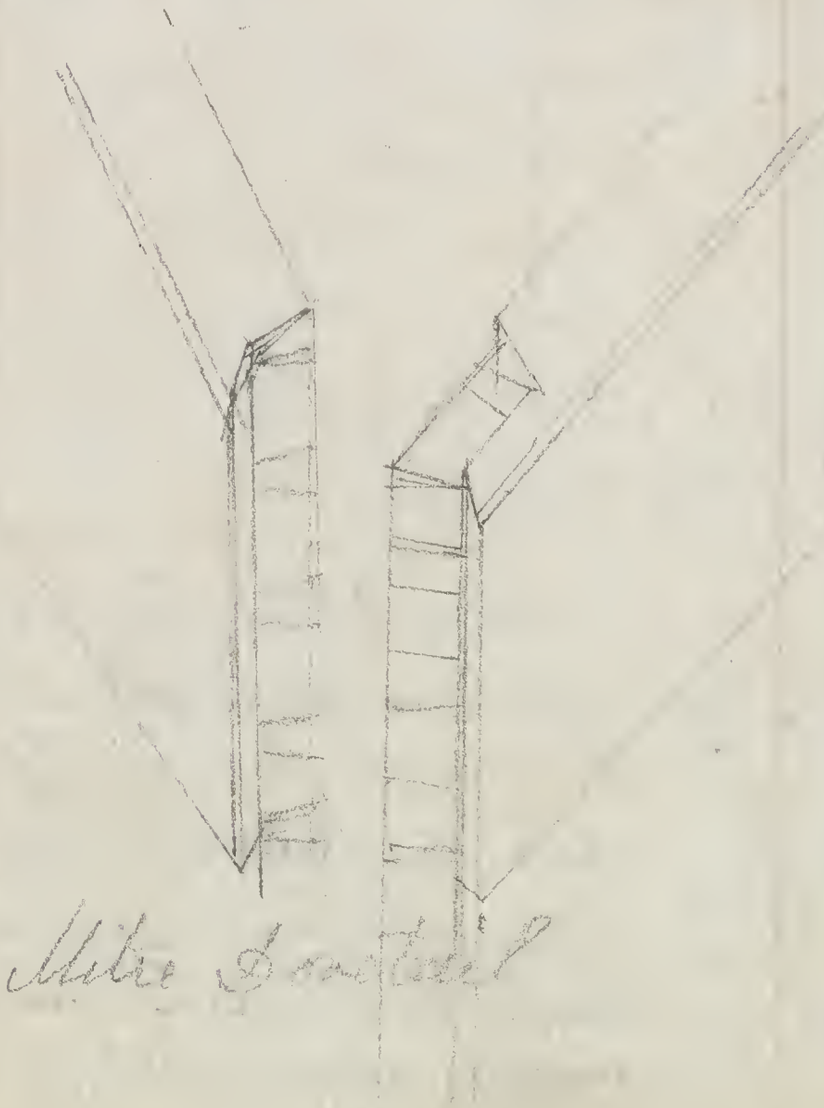



Compound Dovetail.

Strike a mark with the guage across the pin end, slightly broader than the thickness of the socket piece for the length of the pins. And having cut out the pins, lay them on the socket piece, and mark them out as in 7 and 8.



Mitre Dovetail

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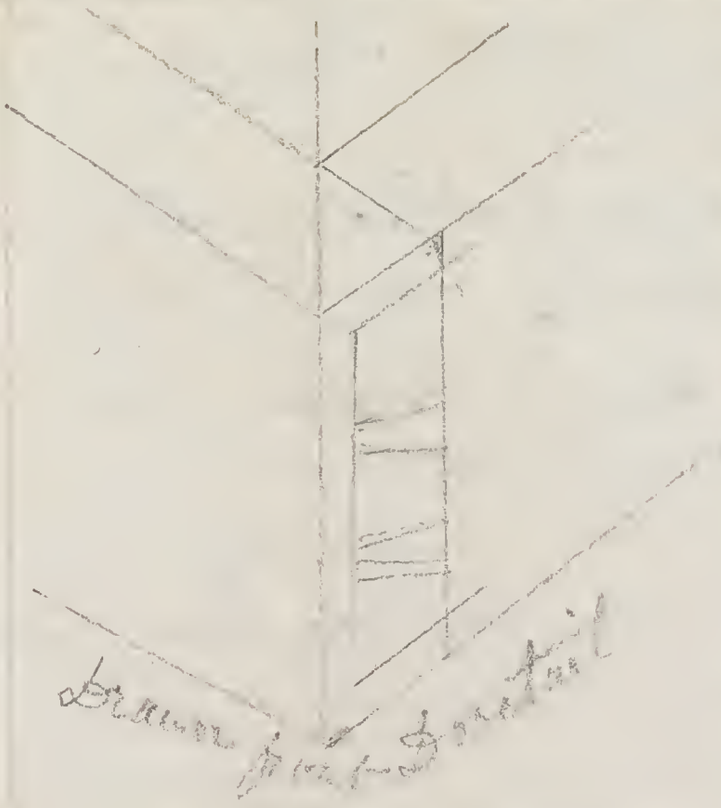

## Iodine Vapour.—

Put a few grains of Iodine in a Florence flask over a lamp, and invert another flask over its mouth; beautiful violet vapours will rise, and condense in beautiful crystals in the upper flask.

## Blue Light.

Nitre 4 Oz: Sulphur 2 Oz: Sulphide Antimony 1 Oz: Powder them seperatly, and well mix in a mortar.— Press the composition well into an old teacup or tin cone, and fire with touch paper.

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## The Constellations & fixed Stars.—

The principal Stars are gathered together into Groups called Constellations.—Since the earth turns round upon its axis at the same time that it revolves in its orbit round the sun, the Sun returns to the meridian or any given point at intervals of 24 hours.—But the fixed stars return to the same point at intervals of 23 hours and 56′; so that they arrive at the same position 4′ earlier each night, amounting to 1 hour in 15 days, or 12 hours in 6 months.—Thus any Constellation situated in the heavens in a particular part at any given time, will be situated precisely opposite 6 months after.—

### January.—

To find Ursa Major (the Great Bear)

Place your back towards the sun's place at noon, and looking towards the north high up, the 7 stars of the Bear will be seen, as in the following diagram.—2 of these a and b are called the pointers. because they point always to a star fixed nearly in the same position; this star is called the Pole star, because it is always directly over head at the North Pole.—These stars revolve round the Pole star every 24 hours. but always in the same relative positions.—

(a) Dubhe. (b) Merak. (c) Phad. (d) Megrez. (e) Alioth.
(f) Mizar. (g) Benetnasch.—

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Pole Star
*

*a
*b
*c
*d
*e
*f
*g

Ursa Major

A line drawn from d, or c, to Polaris, and continued straight on the same distance, will reach the centre of Cassiopeia.—Cassiopeia is always on the opposite side of Polaris to Ursa Major.

a and b, are 5½° apart:— a and d. 10°:— a and f, 19½°
a and the Pole star 23¾°:— Pole star and g, 41½°:—
So that they afford a guage to the eye for other distances in the heavens.— Thus if a comet was announced to be seen 40° North or below the Pole star, it would be not quite so far as is the Pole star from g of the Great Bear.—

Orion's Belt.—

If we turn towards the South, we will now see another easily recognizable group of stars.—

*b
*c
*a *a *a
*e
*d

a a a the 3 stars of Orion's Belt.—
b Betelgeux.—
c Bellatrix.—
d Rigel.—
e Sirius.—

A magnificent Nebula of small cloudy stars is to be

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seen with a telescope.—To the west of Orion's Belt are Aldebaran and the Pleidies.—

The Latitude of a place is easily found, provided it lies north of the Equator, by measuring the altitude of the Pole star above the horizon, because just as high as the star is in degrees, so many degrees are we north of the Equator.—

The day of the month, and the time of night may also be found from the telescope.—

February.—

Now facing the west, the Pole star will be on our right hand.—If then we look up, we shall see nearly overhead, but a little to the right, a group of 5 bright stars.—These constitute the Constellation

Cassiopea.—

which may also easily be found by tracing a line from the middle of the Great Bear through the Pole star, and producing it to an equal distance beyond the Pole star, when it will reach Cassiopea

Perseus.—

To the left of Cassiopea, and very high up, 3 bright stars will be seen.—These are the stars of Perseus.

Capella.—

may be found, by drawing from the Pole star a line

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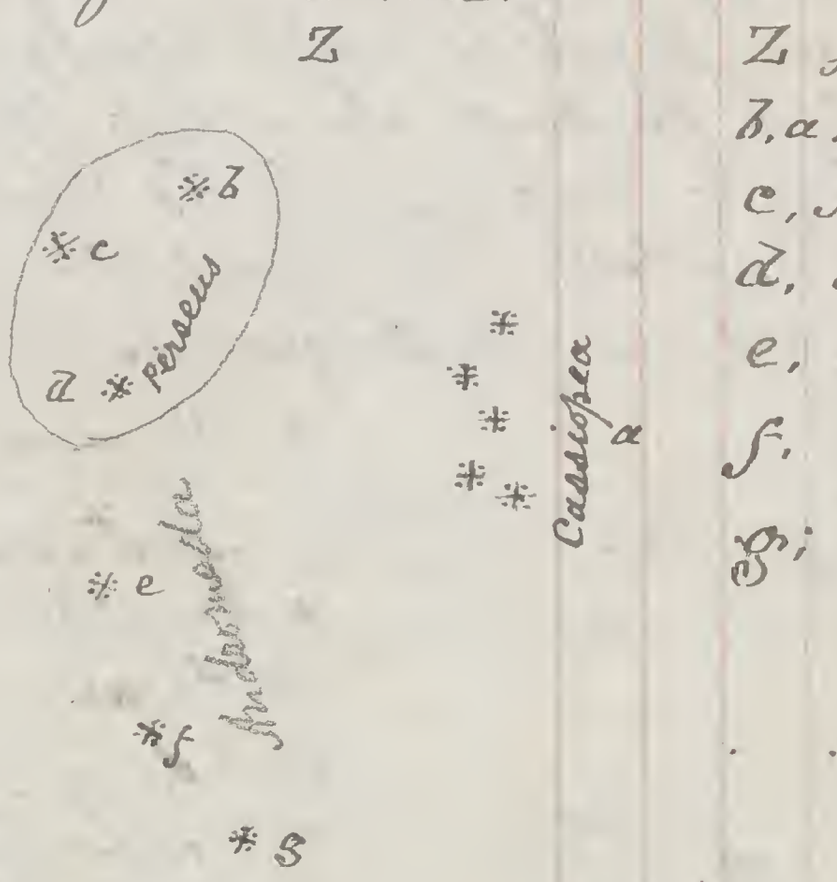
at right angles to a line from the pointers to the Pole-star, this line being on the opposite side of the Pole star to that of the Great Bear: - the first large star that this line meets is Capella. - Capella, α Persei, Almak Mirach, Alpharet, and Scheat, are 6 large stars which form a slight curve round Cassiopea, and are about equidistant from each other. -




Z Zenith. -
b, α Persei. -
c, Algol. -
d, Almak. -
e, Mirach
f, Alpharet. -
δ; Scheat. -

## March.

Orion which was visible in January in the South East about 9 P.M. is now in the south west at the same hour, and will thus pass on towards the west as the season progresses, until it sets immediately after the sun, and being eclipsed by that luminary will be invisible for several weeks until it again rises just before the sun

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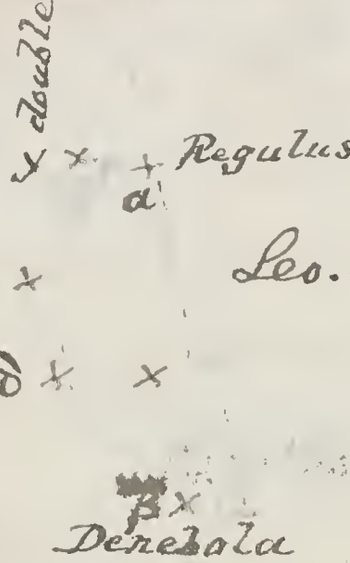
and increases its distance from him, until it again appears in the Evening. -

One of the most remarkable groups during this month is the Constellation of Leo. -

## Leo. -

The 2 Stars C and d of the Great Bear point towards Leo. - It will be visible nearly overhead and slightly to the south about 9 P.M. and the group may be recognized by its similarity to a 5 figure inverted. - The largest star in the Group marked a in the diagram is Regulus.




α, Regulus. -

Arcturus, a beautiful star in midheaven, may be found by tracing onwards the curve formed by the tail of the first bright star is Arcturus the Great Bear, Or by tracing a line from the pole star through the tail star of the Great Bear: carry it onwards and it intercepts Arcturus. -

Arcturus belongs the Constellation Bootes; and the largest star is called Alpha Bootis, the second Beta Bootis, the third Gamma Bootis &c. - Two of the stars in this group Viz Delta and Epsilon Bootis are double stars, that is a smaller star revolving round

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a larger one in a long term of years.—They are doubtless 2 suns travelling round each other.—In the case of Epsilon Bootis, the large star is yellow, and the other greenish blue: while Delta Bootis is white, and its companion deep blue.—

Regulus is also a double star, the smaller one being of a bluish color.—It requires a very good telescope to enable us to see these double stars, but when seen the contrast of colors is very beautiful; in many cases brilliant red and green, pale yellow and blue, orange and emerald green.—They revolve round each other in periods varying from 40 to 1200 years.—

Sirius is very brilliant during the early part of March, and is unrivalled in splendour by any other star.—

Spica Virginus, a very splendid star will be found rather less than midway between the Horizon and Zenith in the south.—By continuing the curve from the Great Bear and Arcturus we find Spica, a pale brilliant star, unequalled by any in its immediate neighbourhood.—

## The Moon.—

The very best time for a telescopic examination of the Moon is from the 2d. to the 10th. day of her age. We can then trace out the form and size of the craters.

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with the peaks in their interiors, observe the steepness of their sides, and the molten masses of lava poured out into the plains. — Each mountain peak stands out like a star from amid the gloom of the surrounding night. Whilst long ranges of mountains, with their ravines clefts, ridges, are as easily seen, as though we were scanning a portion of our Earth from a summit. — Here and there we may perceive vast brilliant masses of rock or lava shining like molten silver, and casting behind them shadows of 10 or 12 miles in length; thus indicating the stupendous height of the actual mass above the plains. When however the moon is near the full, and the sun illumines the whole surface turned towards us, all these contrasts are lost, and one bright mass, only varied by some slightly darker spaces, is alone presented to view. —

## April. —

The principal groups of Stars visible this month with the Great Bear and Capella, the changes in the position of both since January being now very apparent. Arcturus will now be only 7° from the Zenith at mid-night, or nearly overhead. — Spica Virginus will be south during the evenings in the early part of the month. A rather small semicircular group will now be visible high up in the heavens to the eastward; it

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is the northern Crown, the principal star of which is Alphacca.—

Saturn.—

When nearest the earth is yet distant 800,000,000 miles. Is reddish in color, and does not twinkle as scintillate.—a circumstance which distinguishes all the planets from fixed stars.—The planets near the sun revolve around their orbits with much greater velocity than those at a greater distance:—thus the earth travels 68,000 miles while Saturn travels 22,000

Saturn is a gorgeous Planet. It is nearly 80,000 miles in diameter. As much larger than the earth, as an orange exceeds a pea.—The marvellous ring that surrounds it is 170,000 miles in exterior diameter: extending 48,000 miles beyond the body of the planet; but not more than 250 miles in thickness. 8 satellites attend him.—
a, Serpentis, to find.—Trace a line from the pole star through Alphacca in the Northern Crown, and carry it on till another rather bright star is found; it is a Serpentis

Jupiter.—

is 90,000 miles in diameter. And if an inch bullet represented the earth, a sphere 11 inches in diameter would represent Jupiter.—4 Satellites attend him.—The nearest moon revolves so rapidly that it completes one revolution in 38 hours.—

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satelite is about the size of our own moon.-

Across the centre of Jupiter we may see with the telescope, some dark streaks which vary in aspect from night to night.- What they are is unknown, but the serve to determine the time of his rotation upon his axis, which is found to be 9 hours 55' & 49" so that the day on Jupiter is little more than 9 3/4 hours.- Clocks can be regulated on any part of the earth by the eclipses of Jupiter's satelites provided the time is known from the Almanac.-

Jupiter's satelites also prove the velocity of light.- The first of these passes into the shadow of the planet at intervals of 42h. 28'. 36". Now although the times of revolution are always the same, yet as Jupiter and the earth recede from each other, the satelite disappears later and later behind the planet, until its eclipse finally occurs 16'. 36" behind the calculated time.- This is precisely the time required by light to traverse the earth's orbit.- A velocity of 190,000 miles a second the diameter of the earth's orbit must then be 190,136,000 miles. as the above difference occurs when the earth is in that part of its orbit nearest to Jupiter. and that part farthest from him.-

Neptune, the most remote planet of our system, is 30 times as far from the sun as the Earth, or

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2,730,000,000 miles, and would thus require 4 hours for light to travel between him and the earth. Several of the fixed stars are 1,000 times as far as this, and require many years for light to traverse the space between them and us.—

## June.

The following stars will be now visible about 11 P.M. Capella low down near the northern horizon. Whilst Algol, Almach, Mirach, and Alpharat, stretch along from the north round towards the west.—Arcturus nearly overhead of a reddish hue. Vega or Alpha Lyrae east of Arcturus, and may be known by tracing a line from the Pole star nearly at right angles to a line from the pointers to the Pole. Deneb, a very brilliant star, will be seen east of Vega.—While Altair, another bright star, forms the third angle of a right angled triangle, which is made by Vega, Deneb, and Altair.—Low down in the south, is Antares.—While the Great Bear is high up in the north west.—

## Globes and Spheres to measure.

In Globes and spheres, the circumferences, are as the diameters. The surfaces, are as the squares of the diameters.—The solidities, as the cubes of the diameters.—The diameter to the circumference, as 7 to 22, or as 1 to $3\frac{1}{2}$. Therefore the diameter multiplied by $3\frac{1}{2}$, or 3·1416 will give the circumference.

The surface of a Globe is found by multiplying

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the circumference by the diameter.—

The Solid contents of a sphere is found by multiplying $\frac{1}{6}$ of the surface by the diameter. Or by taking $\frac{11}{21}$ of the cube of the diameter.— If the dimensions are taken in inches, the result will be also in inches which must be divided by 1728 to convert them into feet, if that denomination is desired.—

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## Turner's Cement.

Resin 4 pts; Pitch 1 pt.— Melt together, and add sufficient finely powdered brick dust to make it a stiff paste.—

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## Painting.

If the paint is not required to dry in less time than 24 hours, mix it up with 2 parts of boiled oil, to 1 pt. Turpentine. This gives a nice, bright, lustrous paint.—

Mixed up with Turpentine and gold size, dries quickly, and is of good lustre.—

With Turpentine alone, paint will dry in 20 minutes, but is very dead, and requires to be afterwards varnished.—

The addition of patent dryer, makes the paint dry quicker, but it deadens the tint of some colours.

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A coat of thin glue given before the paint, stops up the pores of the wood, and saves paint, but it is certain to scale off by damp.

Paint brushes by turpentine, or soap and warm water, may be cleaned.— They are generally kept with the hair imbedded in a lump of grease, which keeps the hair soft.—

---

## Wood to dye Black.—

Strong decoction of oak bark 1 pt. Sulph^t. Iron 1 oz: Make the mixture scalding hot. Soak the wood in it till sufficiently coloured, and let it dry in the air.— Then add a little Logwood to the solution, make it hot, and steep the wood in it again. It will be a very deep black.— Holly takes this colour better than any other.—

---

## Wood to dye Yellow.—

Rasped Barberry root 1 lb. Turmeric 1 oz. Water 1 gallon.— Boil for 2 hours.— Into this put the article and boil again for some time.— Then let the mixture cool, and add ½ oz: aquafortis.— Soak the article well in this, and a fine yellow will result.—

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## To dye Wood Green.—

Dissolve ¼ lb Verdigris. and ½ oz. Indigo. in 3 pints Vinegar. Boil the article in this for 2 hours.

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## Wood to dye bright red.—

Boil the article 3 or 4 hours with 2 lbs of Brazil dust in 4 gal: water.— The add Alum 2 oz: and Aquafortis 2 oz:. Remove it from the fire, and let the article remain in it till cold.—

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## Wood to dye Purple.—

Logwood chips 2 lbs: Brazil dust ¼ lb; water 2 gal: Boil the article in this for 3 or 4 hours.— Then add Pearl ash 3 oz: Alum 1 oz: and boil again till the colour has sufficiently penetrated.—

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## Preservative Liquid.—

Grain tin 1 oz: Sal Ammoniac ½ oz: When dissolved, this both brightens the colour and renders it more permanent.—

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To Stain Wood Rosewood colour.—

Brush the wood 3 or 4 times over with a hot strong decoction of Logwood. Letting it dry after each. With a stumpy brush dipped in a solution of iron filings in Vinegar, mark and score the article like the real wood.— After drying thoroughly in the open air, polish it with bees wax and turpentine.

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To stain Beech like Mahogony.—

Dissolve Dragons blood 1 oz: in Sp.t. wine 1 pint. and brush the wood over with it.—

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To darken Mahogony.—
Steep it in Lime water.—

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To Stain Wood like Ebony.—

Coat the wood with a decoction of Logwood 6 lbs and galls 1 lb.— Add 1 lb. of Verdigris to the decoction, and give another coat.— Then add Sulph.t Iron 1 lb. to it. and give 3 more coats.—

---

To Stain Bone or Ivory Black.—

Dissolve Nitrate Silver in 3 or 4 times its weight of rain water. Soak the article in it for 1 hour or 2.

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To Stain Bone or Ivory Yellow.—

Dissolve some alum in water. Heat it to 200° and add a little Carbonate Soda.—Immerse the article in this for 1 or 2 hours at 200°.—Then steep it for some time in a solution of Turmeric in water.—Dry in the open air.—

---

To Stain Bone or Ivory Red.—

Immerse the article in a mixture of Nitric acid 1 pt. in 4 pts. of water.—Then steep it in a hot solution of cochineal in water, at not above 200°. Dry in the open air.—

---

To Stain Bone or Ivory Green.—

Dissolve Sal ammoniac 2 pts. Verdigris 2 pts. Rain water ½ pt.; and Nitric acid ½ pt.. Steep the article in it till of the desired shade. Then wash in clean water, and dry slowly.—

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To Stain Bone or Ivory Blue.—

Steep the article in equal parts of Verdigris, Sal ammoniac, Aquafortis, and water. And afterwards in a solution of Pearlash.—

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## Gold Varnish.—

Thoroughly wash and cleanse from colour 1 pt. of Gum Lac.—When dry reduce it to an impalpable powder; add to it 4 times its weight of Spt. Wine, and let it remain in a phial in a warm place till dissolved.—Strain it through cloth for use.—

## Copal Varnish for fine painting.—

Fuse 4 lbs of the palest African Gum Copal.—When completely fused, pour in 1 gallon of hot oil.—Boil until it strings strongly.—In 10 minutes or so, before it gets cold, add 1½ gall. Turpentine.—Strain through a cloth; and if too thick, add more turpentine while hot.—

## Best white hard Varnish.—

Dissolve ½ lb best gum Sanderac in 1 pt of Spt. Wine. add 4½ oz melted Venice Turpentine agitate until well incorporated.—Bottle the Varnish keep from the air, and it will be ready in a few weeks.

## Black Varnish for Metal.—

Fuse and thoroughly incorporate Asphaltum ¾ lb Shell Lac 2 oz: Turpentine 1 pt., Lay on with a brush.

Note. In varnishing. after 3 or 4 coats are given, the surface must be smoothed by fine glass paper, and other 3 or 4 coats, nay even in some cases, to 9 or 10 must be given.—Smoothing each coat after thoroughly dry over

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the last, with the glass paper.- The Castoria must be polished with a flannel rubber dipped in Tripoli powder and water,- and finished with a paste of Suet and flour.-

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## French Polish.

Sp.ts Wine 1 pint; Gum Sandarac ¼ oz; Gum Lac ½ oz; gum Shellac ½ oz; Expose to gentle heat. and frequently shake till dissolved.-

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## Naptha Polish.-

Wood Naptha ¼ lb.; Orange Shellac 1 oz; Dragons blood ¼ oz; Benzoin ¼ oz:-

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## Shellac Polish.-

Orange Shellac 1½ oz: Sp.ts Wine 1 pint.-

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Make a flannel rubber and dip it in the polish, and place a piece of fine old linnen over it. When the polish oozes through the linnen slightly moisten it with Linseed oil, and ap-ply it to the article with free and uniform strokes of the hand. When the rubber is dry, renew the polish and oil as before.- Plenty of rubbing must be given, and not too much polish.- The gloss is improved by finishing the work with a rub of Spirit of wine, or

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Naptha, according to the polish used, but it must be applied very gently and with great care. otherwise it may remove the polish. A coat of gold size may be given before the polish in open grained woods.—

## Coloured Putty.

May be made by using paint powders of the same colours as the wood, instead of whiting to mix with boiled Linseed oil.—

## Strong Glue—

Dissolve common glue in Vinegar, and add a little Isinglass. A higher heat than 212° spoils glue.—

## Fire and Waterproof glue.—

Boil quicklime in Linseed oil.—It will keep any length of time, and only requires to be melted for use.—

## To Gild Steel.

Dissolve Chloride of Gold in Ether, and wash or immerse the article in it. A coating of gold will be left on the steel.—Writing can be done on steel by using the solution with a quill pen.—

## To Copper Steel or Iron.

Dissolve Sulphate of copper in rain water, and write on the article with a quill pen.—

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To Silver Copper or Brass.—

Dissolve granulated silver ¼ oz; in 2 oz Aqua-fortis by a gentle heat. With the solution make a saturated solution or a moist paste with white Tartar. Rub well into the work with flannel, and a coat of silver will result.—

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To drill a hole in Glass.—

Temper a steel drill as hard as it can be made.—Bed the glass on putty, and revolve the brace 200 times a minute, lubricating the drill with Camphor dissolved in Turpentine.—

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To Cut Glass tubes

Use a sharp 3 cornered file under water.

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Soldering.—

Soft solder will unite copper, Tin, Zinc, Iron, Brass, or Tin and any other metal.—The Soldering iron, may be wholly of iron. if the chloride of Zinc is used as a flux.—

Solders.—

| Tin | Lead | Bismuth | Mercury | Melting at |
|---|---|---|---|---|
| 1 | 25 | | | 558° |
| 2 | 1 | | | 340 |
| 2 | 2 | 1 | | 292 |
| 5 | 3 | 3 | | 202 |
| 5 | 3 | 3 | 3 | 122 |

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Very thin sheets of Metal can be soldered best, by moistening the surfaces with the chloride of Zinc, and putting a piece of tinfoil between them, after which they must be held together by a pair of hot tongs until the tinfoil is melted.

## Brazing.

Clean the surfaces from grease as in soldering.— Then bind them firmly together with fine wire, and put them into a clear fire. When just red hot, put some bits of soft brass and a little powdered Borax on the joint, and return it to the fire, and let it remain until the brass is thoroughly melted.—

The Brass used should be soft,— and it may either be used in the form of filings, or granulated by melting it and pouring it into water.

For small articles, the Blowpipe and charcoal is best.—

## Phosphorus Vapour.

Put a piece of solid phosphorus into a flask, then pour 2 oz water on it and heat over a lamp. When the water boils, a most beautiful appearance will result. Streams of fire like rockets will burst at intervals from the water. Some particles will also adhere to the sides of the glass, and immediately display brilliant rays, and thus continue till the water boils, when

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a beautiful imitation of the Aurora Borealis will commence and gradually ascend, until it collects into a pointed cone at the mouth of the flask. When it has continued for half a minute, blow out the lamps, and the fire will rush down from the mouth of the flask, forming beautiful illumined clouds of fire rolling over each other.— When these disappear, a splendid hemisphere of stars will present itself.— After waiting a minute or two, light the lamps again, and nearly the same phenomena will be displayed over again.— Let the lighting and blowing out be repeated 3 or 4 times, so that the number of stars may be increased, and after the third or fourth time, the inside of the flask will be dry. Many of the stars will shoot with great splendour from side to side, while others will burst after rising to the mouth of the flask.— Probably owing to electric excitement.—

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## Coloured Fires

### Inextinguishable fire.

| | parts |
|---|---|
| Nitrate of Potash | 4 |
| Gunpowder | 20 |
| Charcoal | 2 |
| Sulphur | 1 |

### Green Fire.—

| | |
|---|---|
| Dry Nitrate of Baryta | 78 |
| Sulphur | 13 |
| Chlorate of Potash | 5 |
| Orpiment | 2 |
| Charcoal | 3 |

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## Blue Fire. —

| | parts |
|---|---|
| Nitrate of Potash | 7 |
| Sulphuret of Antimony | 2 |
| Sulphur | 1 |
| Gunpowder | 1 |
| Pigment | ½ |
| Oil of Lavender | ½ |

## Yellow Fire.

| | |
|---|---|
| Nitrate of Baryta | 60 |
| Chlorate of Potash | 6 |
| Charcoal | 3 |
| Powdered Amber | 2 |

## Crimson Fire. —

| | |
|---|---|
| Dry Nitrate of Strontian | 8 oz. |
| Sulphur | 2½ |
| Chlorate of Potash | 2 |
| Lamp Black | 1 |

All the ingredients must be finely powdered and perfectly dry. — Great caution must be used in powdering chlorate of Potash, as even dust in the Mortar will cause it to explode. They must be thoroughly incorporated by sifting 2 or 3 times through a fine wire gauze sieve. —

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To prevent Iron rusting.—

Mix with fat, oil, varnish $\frac{4}{5}$ of Sp.ts Turpentine. Apply by means of a rag.—It may also be applied to brass or copper.—

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Sulphurous Acid to prepare.

Mix Flowers of Sulphur 4 ℥ and powdered peroxide of Manganese 5 ℥. heat in a Florence flask.—The result will be Sulphide of Manganese and Sulphurous acid, which may be collected by displacement, or be thrown into water by means of a bent tube to form a solution.—

Or

Put Copper clippings or filings 4 ℥. and concentrated Sulphuric acid 2 ℥: and heat over a lamp or sand bath.—Sulphate of Copper will be formed, and Sulphurous acid given off, through the deoxidation of the sulphuric acid.—

Mercury or Charcoal may be used instead of copper.—

Sulphurous acid may be condensed into a liquid at —10 5° by transmitting it through a tube surrounded by ice and salt.—

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## Bromide of Potash Mixture

℞ Bromide Potass: — ʒvi. —
Water — — — — — ℥xij

Dose:— A table spoonful in a wine glass of water, night & morning

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Nitrate of Silver Lotion (external)

Nitrate Silver — — — — — — — grs X
Water — — — — — — ℥i. — Aqua —

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Rheumatism in dogs.— (Field)
Give 3grs: Trimethylamine in milk, twice a day.—

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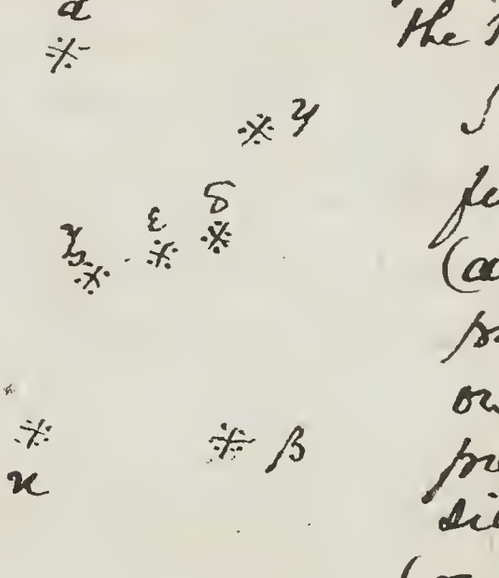
## Constellations to find.

The right lines which direct a, & b. Ursa Major to Polaris, when produced in the same direction, will point out the square of Pegasus, formed of 4 stars of the second magnitude, the 2 upper ones being a Pegasi, and a Andromedae. — A line drawn from the two latter will pass through β and γ Andromedae, and finally to α Persei. a star of the second magnitude near the pole. — α Persei may also be found by drawing a line from d. a. Ursa Major through Polaris. — On the opposite sides of α Persei are situated γ & δ Persei, stars of the 4 and 3 magnitude. A line drawn from a. & Ursa Major will meet after passing through α Persei, Algol (β Persei) a star remarkable as a variable star. — Producing the arcs γ & δ Persei, we find a Arietis. — Below these we come to the Pleiades. — If we join Polaris and a Arietis, and produce it beyond the latter we come to Orion. — Of this group δ ε ζ, are called the Belt.




Sirius

Sirius, the most remarkable fixed star in the heavens. α (α Canis Majoris) is found by producing the Belt of Orion on the Eastern side. — By producing it on the western side, we meet with Aldebaran (α Tauri) But this star may be found by producing the line which connects a Ursa Major and a Arietis. — A line passing through d & b Ursa Major, being produced shall

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-cicenty, will pass through the bright stars of Gemini α β or Castor and Pollux. A short distance on the same line between Castor and Sirius, we find Procyon, or (α Canis Minoris) This may also be found by prolonging the line passing through Polaris and Pollux. — A line passing through α and C Ursa Major, and produced on the side of α above the pole, will point out α or Spica Virginis. which forms an equilateral triangle with Arcturus, and β Leonis. — The line from the pointers to Polaris being produced on the other side of Polaris, will pass through the constellation Leo, which consists of 4 principal stars in the form of a Trapezium. — The most brilliant is of the first magnitude, all the others of the second magnitude. — f and g Ursa Major, being joined in a line and produced will meet with a remarkable star of the first magnitude Arcturus (or α Bootis). — At the side of Arcturus, and in the direction of the stars b d e and f of Ursa M. we find the constellation Corona Borealis (Northern crown) composed of many stars arranged in a semi-circle — the most brilliant only of the second magnitude Vega or α Lyrae, is a conspicuous object, passing the meridian of Greenwich 13° south of the Zenith. — It forms a great triangle with Arcturus and Polaris of which it occupies the summit of the right angle. — At the side of α Lyrae are 2 stars of the third magnitude β and γ! and 3 of the fourth magnitude δ ε ζ. The 4 stars β γ δ ζ. form a parallelogram easily distinguished. — Between Lyrae and Pegasus, the constellation Cygnus is found, consisting of 5 chief stars in the form of a cross. — The line which joins Cygnus to Gemini, is cut in two equal parts by Polaris. — The same line produced beyond Cygnus passes through Altair or α Aquilae, a star of

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the first magnitude. - a Aquilae is situated between γ and β Aquilae, of the third and fourth magnitudes. -

## Zodiacal Constellations. -

are 12 in number. -

I Aries has 2 very conspicuous Stars in the head of the Ram, about 4° apart. They are the nautical star, Hamal, of the 2d mag: and Sheratan of the 3d. -

II Taurus is just rising in the East, when Aries is 27° above the horizon. - It is one of the finest Asterisms, and includes Aldebaran 1st mg: forming with Hyades the letter Y in the face of the Bull. On the left shoulder, is the Pleiades. -

III Gemini has 2 principal stars, Castor of the 1st and Pollux of the 2d mag: 4½° apart. - In the neighbourhood of Propus, a star of 5th mg: - In this constellation Sir J. Herschele found Uranus, and it served to indicate its position for many years. -

IV Cancer has no very conspicuous star. 2 of the 4½ Mg: - the Asellii (the Asses) and Persepe (the Manger). - A nebulous cluster at the distance of 2°, distinguishes this constellation. -

V Leo, a brilliant constellation, has Regulus of the 1st mg: in the breast of the Lion, and Denebola of 2d mag: in the tail, about 25° apart.

VI Virgo has Spica Virginis of the 4th mg: in the Wheat Ear, remarkable for its solitary splendour

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having only 1 star of 4 1/2 Mg: near it, - called Al-simak-al-a-zal.-

VII Libra has 4 subordinate but bright stars, which form a quadrilateral figure. 2 in the north-ern, and 2 in the southern scale, 7° and 6° apart.

VIII Scorpio is a beautiful collection of stars. among which Antares (in the heart) is of 1st Mg: and is of a remarably red colour.-

IX Sagittarius has 5 stars of 3rd and 4 1/2 Mgs which form a figure resembling a straight handled dipper. Called the Milk dipper, because situa-ted in the Milky Way.-

X Capricornus has only 2 stars of 3rd and 4 1/2 Mgs:- Owing to the precession of the equinoxes the Sun does not reach this constellation till the middle of January.-

XI Aquarius is recognisable by 4 stars of 4 1/2 Mg:- so placed as distinctly to form the Letter Y.- Visible about the 10th of the Waterbearer

XII Pisces is a loose assemblage of small stars not readily traced, occupying a large triangular space in the heavens.- This is the first constel-lation in the Zodiac, opening the Astronomical year, and preceding our Vernal Equinox.-

## Northern Constellations.-

are 35 in number.- Of these, Ursa Major is the most conspicuous, consisting of 3 principal stars forming a triangle in the tail: and 4 forming a quadrangle on the body of the Bear.-

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Commencing at the tip of the tail, we have Benetnasch 2nd Mg: Mizar 7° distant west. and Alioth about 4½° further off. 5½° from Alioth, at the root of the tail, is Megrez.— South of it Phad, forming the shorter side of a ~~triangle~~ quadrangle.— On the opposite side 8° west of Phad, is Merak. And 5° north towards the pole, is Dubhe, the brightest star of the constellation.—

Dubhe and Merak, are called the Pointers; because a line drawn through them, and carried on about 29° in the same direction passes almost over Polaris. which is close to the north pole.—

Ursa Minor consists of 7 stars. 3 of the 3rd Mg: and 4 of the 4th Mg: Polaris is the important star of this group. It is between the 2nd and 3rd Mgs: — It is situated in the tip of the tail of Ursa Minor, and appears stationary: the rest of the constellations appearing to revolve round it, in the diurnal revolution of the sphere. — Polaris is important, as on any part of the northern hemisphere, its altitude above the horizon, is always equal to the latitude of the place.—

All the stars appear to revolve around the pole of the ecliptic, owing to the real revolution of the ~~earth~~ pole of the Earth round it.— A revolution, however, which requires 26,000 years for its performance.—

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Bootes appears among the stellar groups: to be driving Ursa Major, hence it is called the bear driver.— Bootes has Arcturus of the 1st mg: long supposed by the ancients to be the star nearest the earth.—

## Southern Constellations.

are 46 in number, the most important being Orion, which constitutes the richest part of the visible heavens.— and when on the meridian (which occurs about 10 P. M. Jany 1st) presents most magnificent view the starry heavens offer. Orion is visible in turn to all the habitable world, the equinoctial passing through the centre of it.— 4 principal stars in the form of a long square or parallelogram, form its outline.— Betelgeux of the 1st mg: is 7¼° off Bellatrix of the 2d.— Saiph of the 3d mg: and Rigel of the 1st 8½ west of Saiph, and 13° of Bellatrix.— Canis Major on the South east of Orion, contains 1 star of the 1st mg: (Sirius,) 4 of the 2d mg: and 2 of the 3d mg: Canis Minor east of Orion, and north of Canis Major, has 2 brilliant stars,— Procyon, of the 1st mg: and Gomelza, of the 2d about 4° to the south east.

### Stars of the 1st Magnitude

North.— G.—

Vega or α Lyrae.— Capella or α Aurigae.—

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Arcturus or a Bootes. — Aldebarran or a Taurus. — Beteigeux or a Orionis — Regulus or a Leonis. — Altair or a Aquilae. — Deneb or a Cygni. — Procyon or a Canis Minor. —

South. 5. —

Sirius or a Canis Majoris. — Rigel or β Orion. Spica or a Virginis. — Antares or a Scorpio. Fomalhaut or a Piscis Australis. —

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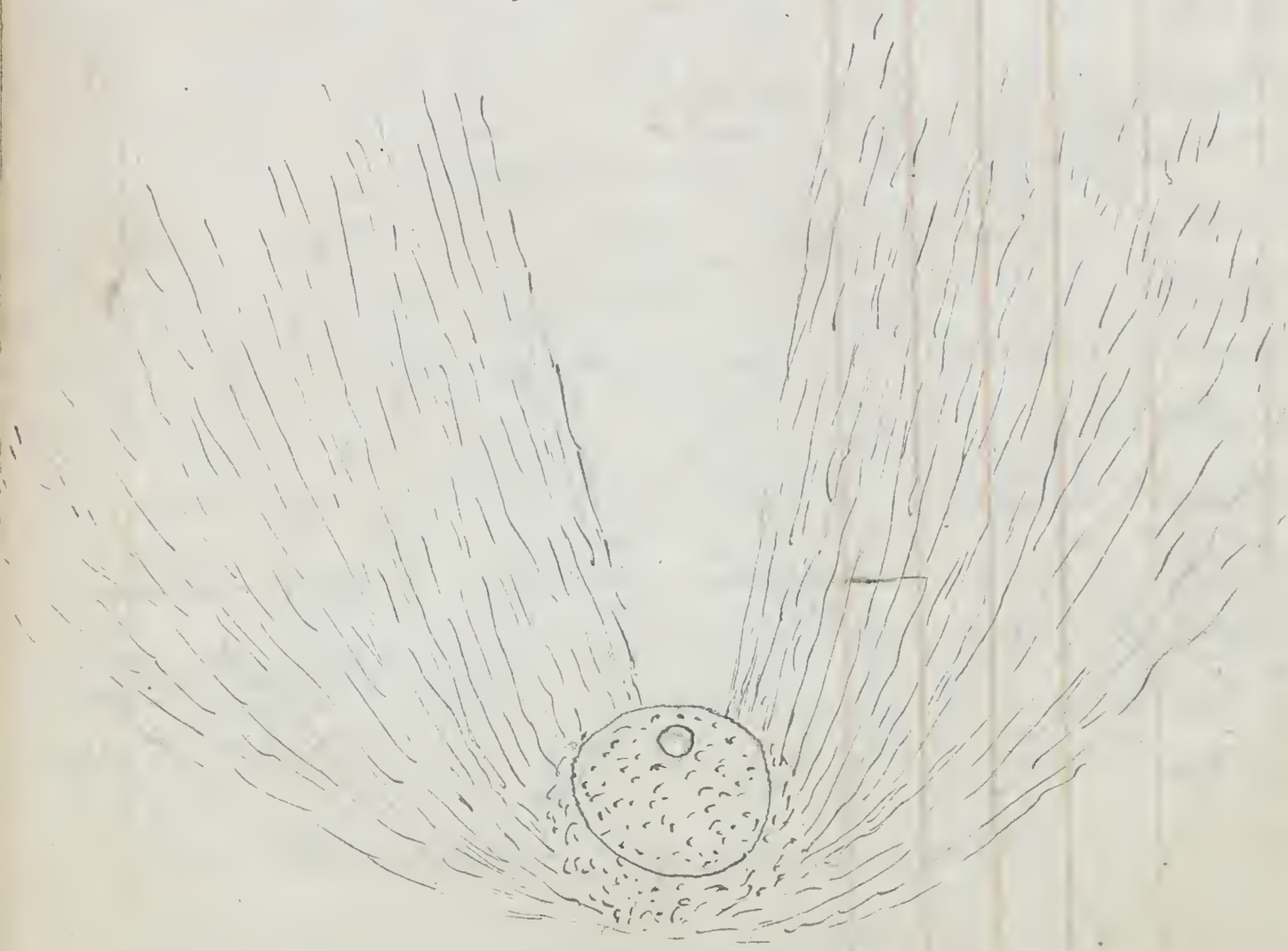
Appearance of Coggia's Comet through my Telescope. July 15th 1874. —



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## Clusters & Nebulae

### Resolvable. —

In Hercules. visible to the naked Eye on a clear dark night, — consisting of stars 10th to 13th Mg. —

| R. A. h. m. | North Polar distance | |
|---|---|---|
| 15. 10 | × 84° — 16′ | |
| 21. 25 | × 91 — 34′ | require a very powerful Glass to resolve it. — |
| * Nebula of Orion. resolvable only by Lord Rosse's Telescope. | | |
| Do of Andromeda. visible to eye on clear dark night | | |
| 281° — 49′ | 59° — 11′ | Annular. Lyra |
| 18° — 45′ | × 77° — 59′ | round disck. — |
| 202° — 13′ | × 107° — 1 | round with central nucleus |
| 59° — 43′ | 47° — 57 | Do Do |
| 59° — 39′ | 59° — 40′ | Do Do |
| 295° — 5′ | 39° — 54′ | Do Do |
| 271° — 45′ | × 109° — 56′ | Oval with 2 nuclei |
| 80° — 3′ | 55° — 54′ | round. 3 — Do |
| 166° — 12° | 34° — 4′ | Do no nucleus |
| 174° — 20′ | 55° — 31′ | Dumbell. — |
| 140° — 38′ | 67° — 45′ | |
| 183° — 18′ | × 84° — 35′ | |
| 342° — 48′ | × 103° — 43′ | |
| 272° — 42′ | × 106° — 15′ | |
| 200° — 40′ | 41° — 56′ | Cometary |
| 281° — 49′ | 57° — 11′ | Annular in Lyra |

* The Nebulae of Orion is situated about 6°. 30′ to the East of Rigel, and about 1°. 15′ above the latter, approximately. R.A. 5h. 32′ — 88°. 13′ — Polar distance 96. 8′ South Dec. 6. 8′ — Altitude 28° 53′ By one observation. —

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## Population of the British Possessions

| | |
|---|---|
| | 240,000,000 |
| India according to Cassell | 190,663,623 |
| Ceylon, Straits Settlts. & Labuan | 2,718,282 |
| North America | 3,748,854 |
| Australia & New Zealand | 1,978,748 |
| West Indies, Honduras, & Guiana | 1,280,268 |
| Cape of Good Hope & Natal | 855,931 |
| Gold Coast, Sierra Leone, Gambia, Lagos | 339,654 |
| Mauritius, | 318,384 |
| Hong Kong | 124,198 |
| St. Helena | 6,241 |
| Bermuda | 12,121 |
| Falkland Islands | 811 |
| Malta ~~& Gibraltar~~ | 141,918 |
| Gibraltar | 16,454 |
| | 202,405,690 |
| British Isles | 32,236,713 |
| Total | 234,642,403 |
| Grand total | 283,742,067 |

## Possible Combinations of the Alphabet

620,448,401,733,239,439,600,000

All the men in the world could not write all these permutations in a thousand million years, supposing that each note 40 pages

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a day, each page containing 40 permutations.—

## Distance of the Sun & Stars.—

It takes a ray of light 8′. 16″ to reach the earth from the Sun. A cannon ball travelling 1760 feet a second would require 9 years to do the distance.— A Locomotive would reach the Sun in 200 years; the farthest star in 40,000,000 years.—

## Geometrical Progression.—

If 1 grain of wheat be placed on the first square of a chessboard. 2 on the second, 4 on the third, and so on to the 64th, the total number of grains will amount to 18,446,744,073,709,551,615.— All the world could scarcely produce it in 70 years.—

## Increase of Money at Comp.d Interest

A single Sou placed out at Interest at the birth of Christ, 1874 years ago, would now be worth a thousand billion times more than a solid ball of gold the size of the earth.—

## Burns and Scalds.—

Apply white of Egg, or Collodion. If the former 7 or 8 successive applications will effectually soothe the pain and exclude the air.— A strong solution of nut galls, oak bark, or tea, containing Tanin, when applied to an abraded surface, chemically combines with the gelatinous effusion from the sore, and

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protects it from the action of the oxygen of the air by forming an artificial skin of leather over it. The Black oil page 85, will also be an excellent application for Scalds or Burns.—

---

## To find the 1st point of Aries at any time

1 A line projected through the centers of the Sun and Earth, at the Vernal and Autumnal Equinoxes, occurring on the 21st March at Noon, and on the 21st September at Midnight, will also pass through the 1st point of Aries.—Hence the 1st point of Aries will be upon the meridian of any place on the earth at these times.—

Now, as any particular part of the heavens arrives at the meridian each day sooner by 4 minutes = 1°, it will be easy to find how many degrees beyond or to the right of the meridian, the 1st point of Aries is situated at any given time and hour, by numbering 1° for each day that has elapsed since the last Equinox, which will indicate the number of degrees that it is beyond the meridian at Noon or Midnight, according as the preceding Equinox was the Vernal or Autumnal one.

Again, owing to the diurnal rotation of the Earth on its axis, any given part of the heavens passes onward towards the west at the rate of 15° an hour; hence for any number of hours before Noon or Midnight respectively,

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as the case may be, we must subtract 15° for each hour ~~from~~ from the number of degrees indicated. - Or if after Noon or Midnight, add them thereto. -

Example. - What position will 1st ♈ point of Aries be in regard to the meridian at 9, 0 clock on the Evening of November 10th. -

The difference is 30 days = 30° West at Midnight
Subtract 3 hours or 45° = 45°
5° West at 9. 0 clock

2 To find the R. A. of a star by its position in regard to the Meridian. -

Ascertain the number of degrees the 1st ♈ point of Aries is east or west of the meridian by the foregoing rule.

Next, find the number of degrees the star is east or west of the meridian, by the circle of R. A. - Then if both ♈ and the star be west of the meridian, but the latter situated to the left of ♈ or ~~east~~ to the meridian, subtract the one from the other, and the product will be the R. A. of that star. -

Thus at 9. 0 clock in the Evening of November 10th a star is found to be 3° west of the meridian. What is its R. A. - Now 3 - 5 = 2° R. A. -

3 But if both being west of the meridian, the star is situated to the west of ♈ or a greater

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number of degrees from the meridian. – Then subtract the one from the other, and the product again from 360. when the result will be its R. A.

Thus at 9, o'clock on the evening of November 10th a star is found to be 20° west of the meridian. what is its R. A? – By the first rule we find ♈ to be 5° west at that time. –
And 5 – 20 = 15. And 15 – 360 = 345 R. A. –

4 If the star be east of the meridian, while ♈ is west of it. Then the one added to the other, will give the R. A. –

Thus at the time and date above given, a star is found to be 20° east of the meridian. what is its R. A.
20 + 5 = 25° R. A. –

5 If both are east of the meridian, but the star the greatest number of degrees east. Then subtract the one from the other, and the difference is the R. A.

Thus a star is found to be 30° east of the meridian. when ♈ is calculated to be 10° east, what is its R. A?

Thus 10 – 30 = 20° R. A. –

6 If both are east of the meridian, but the star nearest thereto. – Then subtract the one from the other, and the product again from 360, and the result will be the R. A. –

Thus when ♈ is found to be 40° east, what is the R. A. of a star 10° east of the meridian?

Thus. 10 – 40 = 30. – And 30 – 360 = 330 R. A.

7 NB. To find how many degrees Aries is east of the meridian at any time, subtract the

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ascertained number of degrees west from 360, and the product is the answer.— Or a glance at the inner circle of R. A. will indicate it.—

8 NB. Degrees of R.A. are always counted towards the left of the 1st ♈ point of Aries.—

9 To find a star, when its Right Ascension and Declination are given.—

First ascertain the position of Aries by Rule 1st. Then turn the telescope the given number of degrees towards the left from that point, when it will be in the position of the R. A.— The Declination, Polar Distance, or horizontal Altitude, as the case may be, will shown by their respective lines on the Quadrant.—

10 If ♈ is east of the meridian while the Star is west of it,—

Find the position of Aries in degrees east, which added to the degrees of the star west of the meridian, and that sum subtracted from 360 will give its R. A.—

11 NB. As a sidereal day consists of 23 hours 56′ 4″. in computing the position of ♈, or the return of any star to the meridian, we must add ¼° for 15 days; ½° for 30 days; 1° for 60 days, and so on to the usual computation of 1° westing per day.—

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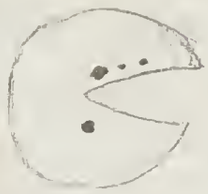
## Nebula of Orion



R.A. 88°.15' or 5H.52'
S.D. 5°.8
P.D. 96°.8' ans observation

## To find the circumference of a Circle

Say as 7 : 22 :: diameter to the circumference

or

Multiply the diameter by 3.1416. —

## Platinum to Solder.

To solder a small piece of Platinum to brass:—Place a piece of tinfoil between the two metals, previously moistened with solution of Sal ammoniac, and heat over a gas flame, or by a blow-pipe; taking care to press them together by a piece of Wire.

## Horse-shoe Electromagnet to work a Bell

Dia: of core ½ in: with 2 layers of No. 16 wire, if in a room.—A longer circuit requires a finer wire or card bobbins.—

## Parchment Paper

Dip unsized paper in a solution of Alum, then into commercial oil of Vitriol for 5 or 6 seconds and wash well, first with water, then with dilute ammonia, and dry.—

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## To find the Area of a Circle.

1 Multiply ~~half~~ the radius, by half the circumference.

2 Multiply the circumference by the diameter and divide by 4. The product is the area.

3 Multiply the square of the diameter by .7854.

4 Multiply the square of the circumference by .079577.

5 Divide the square of the circumference by 12.5664.

6 Multiply the square of the radius by 3.1416.

To find the diameter from the circumference Divide by 3.1416. Or Multiply by its reciprocal .31831.

---

## Parchment paper.

Is made by passing paper made from linen or cotton fibre through a mixture of Sulphuric acid and water, and then washing. — According to Lüdicke, the acid superficially transforms part of the cellulose into a starch like substance, which cements the fibres of the paper together. — The paper is decreases 5 to 10 p: cent, — and strengthened 3.84 to 4.55 fold, slightly diminished when wet. Is more hygroscopic. Is as efficient as a separator of fluids as porous Earth.

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## Suns Declination.

### North.

| | | | | | |
|---|---|---|---|---|---|
| March | 21 | 0 | September | 21 | |
| " | 31 | 2°.36′ | " | 18 | |
| April | 10 | 5°.12′ | August | 8 | |
| " | 20 | 7°.48′ | " | 29 | |
| " | 30 | 10°.24′ | " | 19 | |
| May | 10 | 13°.0 | " | 9 | |
| " | 20 | 15°.36′ | July | 30 | |
| " | 30 | 18°.12′ | " | 20 | |
| June | 9 | 20°.48′ | " | 10 | |
| " | 21 | 23°.30′ | June | 30 | |
| | | | | 21 | |

### South.

| | | | | | |
|---|---|---|---|---|---|
| September | 21 | 0 | March | 21 | |
| " | 30 | 2°.36′ | | 10 | |
| October | 10 | 5°.12′ | February | 28 | |
| " | 20 | 7°.48′ | " | 18 | |
| " | 30 | 10°.24′ | " | 8 | |
| November | 9 | 13°.0 | January | 29 | |
| " | 19 | 15°.36′ | " | 19 | |
| " | 29 | 18°.12′ | " | 9 | |
| December | 9 | 20°.48′ | December | 30 | |
| " | 21 | 23°.30′ | " | 21 | |

Any of the planets will be found within 9° above or below the Suns place in the ecliptic

| | |
|---|---|
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as indicated in the above table. –

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## Magnifying power of Lenses, to calculate. –

The distance at which the average human Eye sees most distinctly, is 10 inches. –

The magnifying power of a Lens or combination of Lenses used as a single Lens without the intervention of an Eye piece may always be obtained by dividing 10 by the number expressing the focal length of the said Lens in inches. – For short focal lengths, the dimensions may be expressed in $\frac{1}{8}$ ths, $\frac{1}{10}$ ths or $\frac{1}{16}$ ths provided the 10 inches is also converted into the same denomination as the focus is expressed in. – Thus.

What is the power of a Lens of 4 in: focus? – Now $10 \div 4 = 2\frac{2}{4}$ power. –

What is the power of a Lens of $\frac{1}{5}$th inch focus? – Now there are 50 times $\frac{1}{5}$ in: in 10 in: Hence 50 is the power

2. –

When the focus of a Lens is under 1 inch, but an aliquot part of it, and having 1 for a numerator its power may be found at once by simply multiplying the length of focus by the denominator of the 10. – Thus 1 inch focus is equal to a power of 10. – $\frac{1}{2}$ in: focus, to 20. – $\frac{1}{3}$ to 30. – $\frac{1}{4}$ to 40. – $\frac{1}{5}$ to 50. – $\frac{1}{8}$ to 80. and so on. – But if the fraction is $\frac{3}{8}, \frac{5}{8}$ or $\frac{7}{8}$, multiply the denominator by 10. and divide by the numerator.

## Compound Microscope, power to calculate. –

1st Compound objective with Lenses seperated, to find power of. – "Add the reciprocals of the focal lengths of the seperate Lenses together; the sum will be the reciprocal of the focal length of the compound Lens." Should however any of the Lenses be concave, the reciprocals of the focal lengths of such Lenses must be subtracted from

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the reciprocals of the focal lengths of the convex lenses.— The equivalent focal length having thus been obtained, the distance between the middle of the combination composing the objective, and the field lens must be measured.—

* Note.—The image produced by any convergent lens has the same size as the object, when both object and image are at the focal length of the lens, on opposite sides; and if the eye was placed exactly at the focus, no amplification would be apparent.—But as the rays cross and diverge, it will be easily understood, that at twice that distance the diameter of the image will be doubled, and so on; the image increasing in diameter in exactly the same ratio as the number of times the focal length of the lens is contained in the space between the field lens and the objective. Consequently if the distance between the O. L. and F. L. is divided by the focal length of the O. L. we will find the magnifying power of the O. L. at that distance.— Or the size the object would present to the eye, if placed in the position of the F. L. Suppose the focal length of the O. L. to be ¼ inch and the distance between it and the F. L. to be 10 inches. This will be equal to a power of 40. for ¼ is contained in 10 40 times.—

† Ready method of finding the focus of a lens, is to hold it steadily on to the end of a tube marked with inches divided into 8ths and 16ths, while a piece of wood with straightened faces is slid up and down till the focus is found.— focusing

† In the case of a compound objective consisting of 2 or more lenses joined close together so as to act as one lens, the focus may be found as in the case of a single lens.—

2 Power of Eye piece to find.—

"Divide twice the product* of the focal length of the two lenses, by their sum, and find how many times this last quotient† is contained in

* obtained by multiplying them by each other. | † expressed in inches

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10 inches.—

Example.—The focal length of E.L. is 3 in:—and the R.L 1 inch.—

Now, $3 \times 1 \times 2 = 6$.—And $6 \div 4 = 1\frac{1}{2}$.—And $10 \div 1\frac{1}{2} = 6{\cdot}66$ = Magnifying power of Eye-piece.—

3 —To find the power of the whole instrument,—"Multiply the power of the objective, by the power of the Eye piece!"

Thus. The power of the O is 40, [redacted] that of the Eye-piece 6·66. what is the power of the instrument?—

Now $40 \times 6{\cdot}66 = 266{\cdot}4$ = the entire power.—

---

Power of Own Microscope.—When closed down.

| | | | |
|---|---|---|---|
| Focal length of Compound O | $\frac{1}{8}$ in:— | No 1 | $\frac{3}{8}$ |
| Do — Do " | E.L.— $\frac{11}{8}$ or $1\frac{3}{8}$ in: | 2 | $\frac{4}{8}$ |
| Do — Do " | E.L — $\frac{10}{8}$ or $1\frac{1}{4}$ in.— | 3 | $\frac{7}{8}$ |
| Distance between O and F.L.— 5 inches. | | 2 & 3 | $\frac{5}{8}$ |
| | | 1 & 2 | $\frac{83}{16}$ |

---

1 Now $\frac{1}{8} \times 5 = 40$ = power of O. at 5 inches interval.—

Power of Eye piece; denominations estimated in $\frac{1}{8}$ths.—

Now $11 \times 10 \times 2 = 220$.—And $11 + 10 = 21$.—And $220 \div 21 = 10{\cdot}5$.—Hence $80 \div 10{\cdot}5 = 7{\cdot}62$ = Magnifying

2 power of Eye piece.—

Power of entire instrument.—Now $40 \times 7{\cdot}62 = 304{\cdot}8$.—

closed down.—

With the interposition of a Lengthener tube 5 inches in length between the O and E.L. the power is double, or 609·6

---

Powers with different OLs.—

| | closed. | with Lengthener. | Diam: of Field 300 power | 600 power |
|---|---|---|---|---|
| No 1 | 99 diam: | 198 | | |
| 2 | 43 " | 86 | $\frac{1}{64}$ in: | $\frac{1}{128}$ in: |
| 3 | same | same | | |
| 1 & 2 comb: | 200 | 400 | | |
| 2 & 3 Do | 99 | 198 | | |

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## Water Power. — See Vol: 2 of Notes. Page 108. —

In the case of small streams, throw a dam across it by means of a deal of wood like a door sill, and confine it at the sides, keeping it high enough to render the water still before it falls over the edge of the deal. — Gauge the depth of the water running over the edge of the wood. This depth multiplied by the breadth of the deal forming the dam will give the area of the water, and this area multiplied by 16 — (the distance it would fall in 1 second.) — Reduce the product to cubic feet, and the result will be the number of cubic feet supplied by the stream per second: which multiplied by by 60 will give the number of cubic feet per minute. —

area

### Horse power of Turbine. —

Multiply the cubic feet per minute, by the fall in in feet. Then by ·8, and divide the product by 704 = horse power of water acting on turbine. —

---

## Microscopic objects to estimate size of. —

Estimate their length in 8ths, or 16ths, or ~~32nds~~, or $\frac{1}{32}$ ds, or ~~64ths~~, of an inch. The estimate in ~~halves~~, ~~quarters~~, $\frac{1}{10}$, $\frac{1}{20}$, $\frac{1}{40}$, &c will do as well; and in whatever dimensions they are estimated, multiply the power used by ~~the denominator and~~ divide by the numerator. ~~or number of dimensions of the image.~~ and the product will give the real size of the object. Thus a diatom appears $\frac{2}{8}$ in: long under a power of 600 Now $600 \times 8 \div 2 = 2400$; or it is really $\frac{1}{2400}$ of an inch in length. * In this manner an approximation to the real size of objects can be easily arrived at. — If the scale is divided into $\frac{1}{10}$ ths, always multiply the power used by 10, and divide the product by the number of divisions on the scale corresponding to the size of the object. —

---

Or $\frac{2}{8}$ Now $600 \times 8 = 4800 \div 2 = 2400$. —

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## Steam Engine, Horse power to estimate

From the pressure of the steam expressed in pounds per square inch, deduct 1½ ℔ per sq$^{re}$ in: for loss by friction. Multiply the area of piston in sq$^{re}$ inches by the remainder. Multiply this result by the space travelled by the piston per minute expressed in feet, and divide by 33.000. The quotient will be the actual horse power.

Editor of C. M.

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℔ Watsons prescriptions for Rheumatic Gout.

℞ Vini Sem Colchici ℥j ℈

Take 20 drops in water every night at bed time. —

---

℞ Sodii Iodidi ——— ʒ ij

Aquæ ——— ℥j ℥vj

Take a desert spoonful in water 3 times a day after food. —

---

Podophillum Pills

℞

Podophyllum gr½ iv

Pill Colocy: Co$^{o}$ ʒjs

℔ Belladona gr: iij ℥ss

Divide into 20 pills. One to be taken every other night at bed time. —

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|---|---|---|---|---|

## Power of Huygkenian Eye piece. Telescope.

Divide twice the product of the focal length of its two lenses by their sum, and divide the focal length of the Speculum or O. G. as the case may be — by the result.

Thus what is the power of L. T.'s whose lenses are 65 and 2·9 focal lengths respectively, and the F. L. of Speculum 66 in:

$$\frac{65 \times 2{\cdot}9 \times 2}{3{\cdot}55} = 1{\cdot}062. \text{ — And } \frac{66}{1{\cdot}062} =$$

62·14 power. —

---

## Varnish. White or Red.

Shell Lac 1½ Oz:; Gum Benzoin ¼ Oz: Amber Resin 1 Oz:; Red Sanders 1 Oz: Methylated Spirits 1 Oz: — Let stand in a bottle 2 or 3 days till dissolved, then filter through fine linen cloth, and apply with a camel hair brush. —

If the red sanders is omitted the varnish will be white. —

---

## Pressure of running Water.

The pressure of water in motion against a plain surface at right angles to the

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direction of the current, is found by multiplying the square of the velocity in miles an hour by 2·1. Or the velocity in feet per second by ·676, which gives the pressure in pounds per square foot. 36 cubic feet of water weigh 1 ton.—

## Turkish Pudding

½ lb Bread crumbs; ½ lb Figs, cut fine; 6 oz: sugar; 6 oz: suet; 2 Eggs; half a Nutmeg; 1 teacupful of milk; half a Glass of brandy.—Boil 4 hours in a mould or shape—a basin will do the same—and serve with wine sauce or melted butter.

## Preserved Rhubarb

Cut 6 lbs of Rhubarb into 2 inch lengths and put it into a jar with 6 lbs sugar and ¼ lb of bruised ginger tied in a muslin bag.—Put the jar in a pan of water, or into an oven, and let it simmer till quite tender. Then pour off the juice into a brass preserving pan or Earthen jar, and add 2 lbs more sugar along with some lemon peel, and allow it to boil 20 minutes.—Then return it to the Rhubarb in the jar with which it must be well mixed.—The muslin bag containing the spent ginger being withdrawn.—It is almost impossible to distinguish this from Chinese Ginger.—

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## Bichromate Battery.

Glass circular cell enclosing Zinc Cylinder, with porous diaphr: Enclosing Carbon. –

Charge. – ½ oz Bichromate Potass dissolved in 1 pint water, to which is added 5 oz by weight of Sulphuric acid. – Fill the inside of Carbon cell with the solution, and water to which a little of the solution is added next the Zinc, which is not amalgama-ted. – Note a saturated solution of bichromate will bear ⅓ of Sulph acid before the salt is entirely utilized. –

Adolphus

---

### Speed of Trains an hour.

Multiply the number of miles between the Stations by 60, and divide by the number of minutes occu-pied in running the distance, the product will be the rate of miles an hour the train is running. –

---

### Revolutions of a Wheel in a Mile. –

1st Divide the number 20160 by the diameter of the wheel in inches; the product will be the number of revolutions it will make in a mile

2d. Multiply the diameter in feet by 3·14159 and divide 5280 by the product – The result is the number of revolutions a mile. –

"

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To find the Seperating power of a Telescope

The seperating power of a telescope entirely depends upon the size of the aperture, and is quite independant of its magnifying power. –

To find the Seperating power, divide 4 5b by the diameter of the Object glass. – Thus, the aperture of my own glass is $2\frac{3}{8}$ and its seperating power 1.9. – E.R.A.S. –

---

Silver Solution for Electrolysing.

Dissolve metallic Silver either in a thin sheet or in a granular form in a solution consisting of 1oz of Cyanide of Potass: added to 8oz. of water.

To recover Silver from a Solution.

Precipitate the silver as Chloride by common salt or Hydrochloric Acid, and fuse it with powdered resin, when it will be reduced to metallic grains. –

---

Amalgam for Electric Machine

Melt in an iron ladle Zinc 2pts Tin 1pt to these add 4pts Mercury previously heated. When hard crumble it with a fine Wood rasp and rub in a Mortar with a little candle grease.

---

Average number of steps in a Mile: – 2,000

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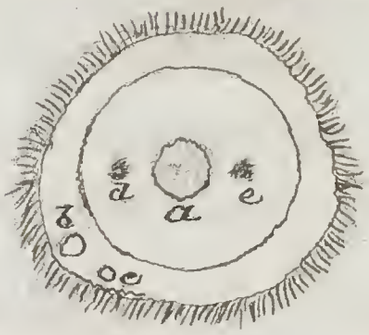
Lunar Walled plain




a conical peak exactly in the centre. b. c, a couple of cratrelets situated on the marginal ring. d, e, a couple of dimly defined dark spots or pits situated one on each side of the central hill. —

---

Expectorant Mixt.

℞

| | |
|---|---|
| Mucilage Gum Acac: | ℥iij |
| Cinn: Aqua | ℥iv |
| Opt. h. Scillae | ℥ss |
| Ipecac: Pulv. | ℥ss |
| Syr: Bals: Tolu | ℥ss ℔ss. |

A. S. M.

---

Breaking Weight of Fir Beams

Multiply the breadth in inches by the square of the depth in inches, and divide by the length of the bearing in feet. The result multiplied by 3 for Pitch pine, or 4 for Red Pine will give the breaking weight in the middle in cwts: —

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## Sympathetic Inks.—

### Developed by heat.—

Write with milk, juice of Onions, or any dilute mineral acid, and hold it near the fire, or pass a hot smoothing-iron over it, when the writing will appear.—

### Green.—

Solution of Chloride of Cobalt appears of a beautiful green while gently heated, and fades away as it becomes cold.—

### Pale Rose.

Dissolve oxide of cobalt in oxalic acid to which add a little Nitre. The writing will appear of a pale rose when gently heated, and disappear on cooling

### Yellow.—

Dissolve equal parts of Sulph: of Copper and Sal Ammoniac in water

---

## Chemical Inks.—

These inks depend upon a chemical reaction, by which writing executed in one solution gives a coloured precipitate when washed over with another.—

### Black

Write with a weak solution of Nut galls.

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Wash over with solution Sulph$^{te}$ Iron.—

Purple.—

Infusion of Logwood, and Sulph$^{te}$ Iron

Blue.—

Sulph$^{te}$ Iron, and Prussiate Potash.

Yellow.—

1 Acetate of Lead, and Chromate or Bichromate of Potash.—

2 Corrosive Sublimate, and Iodide Potash.

Brick Red.—

Prussiate Potash, and Sulph$^{te}$ Copper.—

Blood Red.—

Sulph$^{te}$ Iron, and Sulphcyanide of Potash.

---

Imperial Bushel.

The Imperial corn bushel contains 2218·192 cubic inches.— The Winchester bushel 2150·42. and are to each other as 31 to 32.—

---

## Solution for Bichromate Battery.

Water 1 pint, Bichromate of Potass. 2½ Oz and 2½ fluid ounces of Sulphuric acid, which may be added at twice, as the action diminishes.—

The result is the formation of Sulph$^{te}$ Zinc and chrome alum, of no use.— The above proportion of Bichromate forms a saturated solution in the cold.

Sigma.—

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Privates.

Angina Pectoris.

Remedy: Nitrite of Amyl. — It acts by dilating the arteries.

---

Castors Syrup.—

℞: Phosph. Ferri: cum Quin: et Strych: Dose half a teaspoonful

---

Snuff for cold in the head. (Coryza)

Trinitrate Bismuth ℥VI. Powdered Gum Arabic ℥ij

Muriate Morphia grs ij.—

Pinches of the above to be occasionally taken as snuff.

Dr Ferrier

---

Modified Daniel Battery.—

Wrap a zinc rod with parchment paper, and letting it overlap sufficiently, keep all tight by firmly and closely winding round it, a coil of copper wire, leaving the end free for connection; when the whole is plunged into a solution of Sulphate Copper. The same arrangement may be made with zinc and charcoal.—Using either a thick zinc wire or a cylinder. In either case, the zinc must be amalgamated in the charcoal arrangement, and the exciting fluid used be the same as for the Bichromate battery.—

If the exciting salt used be reduced to powder, and the paper folded in two, with a layer of salt placed between; the arrangement will remain in action many hours.

---

Carbolic wash; external

Carbolic acid 1 part. water 20 parts.—Or Oil 20 parts.—

# Metric Measures of Length.

| Millimetre | Centimetre | Decimetre | Metre | Decametre | Hectametre | Kilometre | Myriametre |
|---|---|---|---|---|---|---|---|
| 10 | 1 | | | | | | |
| 100 | 10 | 1 | | | | | |
| 100 | 100 | 10 | 1 | | | | |
| 10,000 | 1,000 | 100 | 10 | 1 | | | |
| 100,000 | 10,000 | 1,000 | 100 | 10 | 1 | | |
| 1,000,000 | 100,000 | 10,000 | 1,000 | 100 | 10 | 1 | |
| 10,000,000 | 1,000,000 | 100,000 | 10,000 | 1,000 | 100 | 10 | 1 |

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English Equivalents.

1 Millimetre = 0·03937 inch
1 Centimetre = 0·3937 " "
1 Decimetre = 3·937 " "
1 Metre = 39·37 " "
1 Decametre = 32 ft. 9 in.
1 Hectometer = 109 yds. 1 ft. 10¾ in.
1 Kilometre = 1093 yds.
1 Myriametre = 11,093 yds.

Weights.

1 Milligramme = 0·01543 grains
1 Centigramme = 0·15432 "
1 Decigramme = 1·5432 "
1 Gramme = 15·432 "
1 Decagramme = 2 oz. 5 dr. 2 sc. 3 gr.
3 drms. 5 grs. Troy.

Capacity.

1 Litre = 1¾ pint.
1 Hectolitre = 22 gals.

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Trumpeters.

Farriers.

Privates.

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Power of Induction in matter. -

It would seem to be a universal law pervading all matter, that when one body comes into intimate contact with another body, the one possessing the most powerful affinities, or in the most permanent condition, has a certain power of inducing in the other body a state similar to its own. - Thus that the introduction of a ready formed crystal, whether or not of the same kind, into any solution near the point of saturation, will materially expedite the formation of crystals in that solution, is a fact well known to Chemists; while the presence of a diseased portion of the animal body is well known to all medical practitioners to have a powerful tendency to produce diseased action in the neighbouring parts. -

---

Cold in the head (Coryza)

Crystallised Carbolic acid 5 grs: Rec: Sp. to. loine 20 M; Ammonia 5 M; distilled water 10 M. - place a few drops on a piece of blotting paper, roll it into a cone open at the apex, apply it to the nose and inhale through it. -

---

Soluble phosphate, to determine

The usual way is by the Magnesia process. -

Digest 100 grs in 5 Oz of distilled cold water for half an hour with frequent stirring. - Filter and wash. - Make up the filtrate to 5,000 fluid grains. - Withdraw 1,000 grains with a pipette. (this represents 20 grains of the sample) boil in a beaker; and add

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Ammonia drop by drop till ~~till~~ a precipitate forms: then add a few drops of oxalic acid, and finally oxalate of Ammonia; boil; set aside for 15 minutes; then filter and wash.—

Reduce the filtrate by evaporation to 5 Oz: and add 30grs: Citric acid, then ammonia till it smells strongly.—

Next, dissolve 50grs: Sulphate Magnesia in ½ Oz water, add ½ Oz: strong solution Chloride of Ammonia and ammonia in excess, filtering out any precipitate which may form.—

Add this solution to the filtrate and stir well,—and set it aside 12 hours.—Filter, wash first with water to which ¼ of ammonia has been added and finally with water. Dry: ignite first the filter, afterwards adding the residuum, and weigh.—

The quantity of dibasic Phosphate corresponding to the weight of precipitate is calculated as follows.— As 222 : 310 :: x = weight of precipitate The result multiplied by 5 = per centage of soluble phosphate.—

* Another correspondant says As 222 : 234 :: x

---

Hair Oil to promote growth of the hair.

| | |
|---|---|
| Spermaceti | 2 Oz |
| Tinct Cantharides | ½ Oz |
| Essence Bergamot | 2 |
| Beef Marrow | 2 Oz |

Dr Vanessa. Felsland.—

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## Sea-sickness. preventative of

℞:

Hydrate of Chloral ʒij
Sy: of Tolu — — ʒvi
Orange flower water ʒvi
Dist^d. Water ——— ʒiv fo. Aaa

Dose:— Take 2 Tablespoonfuls on first going on board the vessel and lie down in a birth for some time.— Subsequently if sickness is felt to be coming on. 1 tablespoonful may be taken at inter-vals of not less than 4 hours.— Tried and found perfectly successful.—

## Chrome Cement.

For glass. China &c waterproof.

To 5 parts of a strong solution of Gelatine add 1 pt. of acid solution of Chromate of lime.

Cover the surfaces evenly with a freshly pre-pared solution. press them together. and tying them fast expose them for a few hours to sun-light.— The chromic acid is partially reduced by the action of light which renders the mixture insoluble even to boiling water.—

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# Agricultural Notes.

## T. C. Morton. –

Good grass land in old pasture will on an average yield 12 or 15 tons per acre per year.

Grass land worth 30/- per acre may be estimated to yield 8 tons.

8 tons of grass will produce 9 Stones of beef. –

5 tons of grass is required to make 1 Ton of hay. –

1120 lbs of grass will produce 1 lb of beef or mutton

150 ℔ of turnips given alone will produce the same. –

The weight of the aftermath is about ⅓ of that of the hay in its green state. –

Average crops on land worth 30/- per acre of feeding stuffs except grain. –

25 Cwt Wheat straw
24 Tons Mangolds
18 " Swedes
20 Cwt Barley straw
10 Tons Clover.
16 " Rape.
30 Cwt Bean straw. –
30 " Peas do

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## Seed Potatoes

15 Cwt of seed will plant 1 Acre.

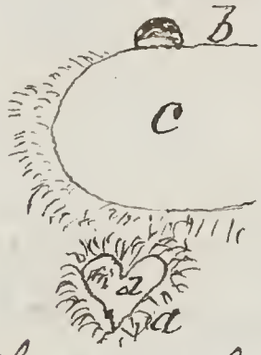
---

## Solder for Gold or other Metals without heat

Brass filings 2 Oz; steel filings 1 Oz; Fluoric acid 2 drms.—Put the acid into an earthen ware vessel and add the mixed filings.—Touch the parts to be soldered over with the acid and join them together. This solder will braze any kind of metal without heat.—

---

## Heart shaped Lunar cavity




a, heart shaped cavity with hills enclosed within its right lobe at a.—This is situated north of the large oval plain C, at a little distance from its northern margin.—b is a deep cavity on the southern margin of C, nearly opposite to a.—The cavity a, seems a depression on the summit of a high triangular mountain.—The diag: is drawn as it appears through the glass, which of course is exactly the reverse of the true positions.—

---

## Low temperature in 1879.

Dec 4–5. 1879 Therm: at Literary & Phil. +7° at G. P. O. at Stocksfield 5°— below zero: Benton —4°: Wooler —6: Gateshead Fell —4: Rothbury —4: Blyth —13.

At a fire in Sandgate N. Castle, on the morning of the 5th a policeman was so overcome by the extreme

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cold that he tumbled off a ladder 30 feet in height.- Strange to say he was but little injured: and as 4 other policemen were conveying him to the police Barracks, one of them fainted from the cold, and likewise had to be assisted home.-

---

Notes by Geo: Culley of Fowberry on the temperature.- Dec 4th 1879. A thermometer 2 ft above the ground registered — 16° at 5 A.M. Another 20 ft above the ground — 7° at 9 A.M. and never during the day rose above — 4°.- The greatest cold noticed by him in 1878 was — 8°. and in 1860 — 13° Dec 4th 1879 is in all probability the coldest day ever experienced in England.-

---

Stimulating Embrocations.
For coughs and chest affections in Children

No 1. ℞
Soap Liniment ——— ℥ij ℥ss
Tinct Cantharides ——— ℥ij ℥ss M.

No 2. ℞
Camphorated oil ——— ℥ij ℥ss
Spt Ammonia ——— ℥ij ℥ss M.

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## Scarlet Fever

Though usually attended by more or less fever, and inflamation of the throat, may exist without either. - The usual rash on the skin may also be absent. - The rash appears on the second or third day, and remains out 3 days followed by shelling off of the skin, commencing about the 4½ or 5th day after the appearance of the eruption. - Scarlet fever is doubtless communicated by specific contagious germs both during the existance of the eruption and during the scaling of the skin. - These infected skin flakes may be conveyed by the air no one knows where. -

Prevention: - isolation of the patient. whenever touched the hands should be washed in water containing 4oz chloride lime to the gallon. - All discharges should be received in vessels containing a solution of Sulphate of Iron 1lb to the gallon. - Condy's Fluid is an excellent disinfectant, and may be made by adding a teaspoonful of Permanganate of Potash to a gallon of water. All cups, spoons &c used by the patient ought to washed in this solution. Carbolic acid has not yet been proved to be a germ slayer. - With the intention of preventing the flakes of dust from the skin from becoming free, it is recommended to oil over the whole surface of the body with olive oil, mutton suet, or camphorated oil, as soon as scaling occurs about the 4½ or 5th day after the appearance of the eruption. This must be done daily until the patient is able to take a warm bath, in which the whole body and head must be well washed with Terebine Soap. - The bath to be repeated every other day till the peeling ceases. -

Disinfecting the room. - After the removal of the patient all bed clothes and other garments must be disinfended on

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lines, the fire place, windows, and all openings closed, and ½ lb roll brimstone broken into small pieces placed on a fire shovel and set on fire with a few ignited coals. - The room must then be closed for 24 hours, after which both doors and windows must be freely opened for a day or two. - The paper should be torn off the walls, which along with the ceiling ought to be whitewashed with quicklime, and the paintings and furniture washed with chloride of lime and soap: - and then wash the floor with soft soap and chloride of lime. -

The Inspector of Nuisances, if applied to, will remove all mattresses, palliasses, beds &c which cannot be washed, and submit them to a hot air apparatus free of expense: or if destroyed, their value will be expended

Belladona is said to be a preventive of scarlet fever, 10 grains of the extract are dissolved in 3 oz of water, and a teaspoonful taken by an adult twice a day. - A child of 4 years may take 15 drops, and one of 7 years 20 drops. but its action is uncertain. - Dr Clark Newton

Note. - I should suggest the taking of 10grs of the Sulphite of Soda twice or thrice a day as a powerful prophylactic. - or the Hyposulphite of Soda. -

A. S. M.

---

Phosphate of Lime

Lime 168 parts, phos: acid dry 142 = 310

Hydrate of Lime

Lime 56; water 18 = 74. -

Bicalcic Phosphate

Lime 112; Phos: acid 142; water 18 = 272.

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## Nitromuriatic Acid

℞

Nitric acid ——— guth: XXIV. to ℥2
Muriatic acid ——— " 96 " 288
Water ——— ℥ XIJ Mh

Dose; — 2 tablespoonfuls after meals. —

---

## Marine Glue

Dissolve seperately equal parts of Shell lac and Indian rubber in coal Naptha, and then mixing the solutions thoroughly by heat. It may be thinned with more naptha. Marine glue is readily dissolved by naptha, Ether, or potash. It is best preserved in a tin box.

When applied, the object must be heated sufficiently to melt the glue which is then rubbed on it. —

---

## Brunswick Black

Melt Asphaltum 1lb then add Linseed oil ½ lb. and oil of Turpentine 1 Quart

The best Brunswick Black is prepared by boiling ¼ lb of foreign asphaltum and 4¼ oz Linseed oil which has been previously boiled Litherage ½ oz. until quite stringy. Then add ½ pint oil Turpentine. — It is improved by being thickened with a little Lamp black. —

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## Hartig's Cement

Cut Gutta Percha into very small pieces, and stir -red at a gentle heat with 15 parts oil Turpentine. Strain through linen cloth; then add 1 part of Shellac, and keep it at a gentle heat, occasionally stirring it. The mixture is to be kept hot until a drop, let fall on a cool surface be- -comes tolerably hard. When used, it is to be heated and a small quantity placed on the glass slide on which the cell is to be fixed. - The slide itself is then to be heated.

## Alcohol in Beer Porter &c

| | | | |
|---|---|---|---|
| Bottle London Porter | 1 Pint | 3/4 Oz: | Govt. Analysis. |
| Mild Ale | Do | 1 1/4 Oz: | |
| London Stout | " | 1 1/2 Oz: | |
| Strong Ale | " | 2 Oz: | |
| Pale Ale | " | 2 1/2 Oz: | |
| Brandy | " | 10 1/2 Oz | |

## Tapeworm in the dog Field, correspondent.

℞ Koussо (Brayera anthelmintica grs 30 Rub into a ball with fat. Give to the dog fasting. - Then give a purge in 2 hours after. - Examine the worm that is passed, and if the head has not come away, repeat the dose after an inter- -val of 3 or 4 days. -

## Muriate Ammonia Lotion.

Sal Ammoniac 1 part, water 8 parts. -

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## Fruit Salt.-

Carbt. Magnesia ½ oz: Bicarbt. Sod 2 oz: Tartaric acid 1½ oz: Epsom salts 1 oz: Cream Tartar ½ oz: Loaf Sugar pounded 2 oz:-- Dry them in an oven on seperate plates; mix well together, and keep in a dry bottle. Dose a teaspoonful in a tumbler of water.-

---

## Worms to destroy.-

Cobbold says, in the human subject I have known 1 grain of Santonine expel a lumbricoid worm as large as a lob-worm.- There is nothing better than Castor oil and Santonine. The dose of Santonine for a dog is from 3 to 5 grs:-

Areca nut is unquestionably a good vermifuge, it is however, to be used rather for tapeworms.- To dogs, ½ to 1 dram doses may be given followed by Castor oil.- repeated twice or thrice a day.- Turpentine may be used in bad cases.- It must be administered cautiously to the dog, and combined with twice as much of either of Castor or linseed oil.- The dose is 1 drm: and in no case should it exceed 2 drms in the very largest dog.- 3 drms of turpentine have been known to produce violent convulsions in a full grown dog.- Calomel in 1 to 3 gr: doses may be resorted to when other remedies have failed; but it is uncertain.-

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(tribasic)
Insoluble Phosph^te Lime

The action of carbonic acid on it in the soil is as follows The carbonic acid combines with $\frac{1}{3}$ of the lime, converting it into chalk, while the remaining $\frac{2}{3}$ unite with the whole of the original phosphoric acid, ~~forming licalcic phosphate lime 168, Phos acid 142 = 310, which is~~ and 18 parts of water, which replaces the 56 of lime converted into chalk.- And the insoluble neutral phosphate of lime is changed into the soluble bi-calcic phosphate.-

Superphosphate of Lime

is prepared by adding 196 lbs of pure sulphuric acid to 310 lb of bone phosphate.- The sulphuric acid combines with 112 parts of Lime, forming gypsum. leaving the superphosphate composed as follows Lime 56: Phos: acid 142:. water 36.- So we have now less lime by 56 parts, replaced by water 18.- The gypsum formed by the manufacture of this $\frac{234}{272}$ parts of superphosphate, amounts to 272 pts, which are mixed together in all superphosphates, besides what may be added as a "drier".-

Should there be any lime in the soil, the superphosphate is immediately converted into the bibasic phosphate.- A body precisely similar to fermented bones.-

Gypsum

Lime 56 pts, dry sulphuric acid 80, water 36 pts. by weight

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## Fluke in Sheep. "Field."

Podophyllin is said to destroy the fluke in sheep.— Boil on simmer 1 oz of Podophyllin root, in 2 pts of water, and give 2 tablespoonfuls two days running to each sheep.— Price of root 1/6 lb. Repeat the dose in 10 days.—

---

## Rupture of Liver (horse) Field.

Haemorage from the liver, generally proceeds from a rupture of some of the glands of the capsule. Give at one dose Pul. Ipecac 2 drms: Gallic acid 4 drms, with perfect rest.— The same dose may be given as a drench to a full grown ox.—

---

## Red water in Cattle. (Field.)

The ordinary red water peculiar to certain pastures is not a disease of the kidnies, but the liver:— and the urine is not rendered red by blood, but by viticated bile and other foreign matter which that organ has failed to seperate.—

Bloody urine is a different disease, arising from a ruptured vessel in some of the urinary passages, and is called ~~Hem~~ Haematuria;— and may be distinguished from the other in the absence of a microscope, by stringy clots of blood being left on straw on which the urine has been voided.— The same treatment will be applicable to Haematuria as for ruptured liver.—

For Red water:— A dose of Epsom salts will generally be all that is necessary, if given at the commencement of the attack.— Or give Extract of Taraxacum 1 oz, and Carbonate of Iron, 1 oz, mixed in a pint of gruel, with Epsom salts 4 oz. every day until purgation is established.— A

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fourth part will be a dose for a sheep.— After purgation is established, the salts should be omitted.—

---

## Fly Poison.

Either a little Nitrate or Chloride of Cobalt dissolved in water, is an efficient poison for flies; but it acts the same on any other animal or on man.

---

## Sedative for Bronchitis in Cattle. (Field)

Laudanum 4 drms: Sweet Spirit Nitre 1 Oz: Tincture of Aconite 10 drops: Water 1 pint. give twice a day; with 12 Oz Epsom Salts; and 4 drms Nitre in the water once a day.—

---

## Carbolic Acid drench for Cattle. (Field)

℞. Carbolic Acid ——— ℥j.
Glycerine ——— ℥iv
Water with a little Soap ——— Oi Aa

To be given daily to cattle infected with foot and mouth disease, as well as to such as are exposed to infection.— And wash the nose, mouth, and feet with the Lotion, and sprinkle the litter with it also.—

### Lotion.

Carbolic Acid 1 part, water 100 parts.—

---

## Salicylic Acid Solution for Cattle (Field)

℞. Put 4 table spoonfuls of the acid in an earthen vessel and pour boiling water on to dissolve it.— Afterwards add hot water till it amounts to 1 gallon.—

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For foot and mouth disease; first disinfect the mouth and nose with the carbolic Lotion, then add half a pint of the Salicylic solution daily to the drinking water.-

---

## Snake bite, Antidote for.-

A solution of Permanganate of Potash injected beneath the skin near the part bitten, has been found in many cases to instantly destroy the virus. - (Field)

---

## Carbolic Lotion.

| | | |
|---|---|---|
| Carbolic acid | 1 dram | for |
| Glycerine | 4 drams | wounds.- |
| Water | 8 oz | |

---

## Tonic Pills.

℞
Sulphᵗᵉ Quinine — gr XIV
Sulphᵗᵉ Iron — gr XII
Extᵗ Gentian — ℥ij fo Ato

Divide into XXIV pills. One twice a day.-

---

## Worms in Dogs.

℞ Santonine — gr ij
Areca nut Pul — ℥ss
Make into 6 boluses with lard
Give in dose of castor oil, the evening previous.
Fast the dog for 24 hours. Then give the boluses.

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followed in 2 hours by a dose of Castor oil. Repeat this treatment 3 times, at intervals of 4 or 5 days.—

Vapor horse

℞. Fil of Male fern ——— ℥iv
Gum Acacia Pul. ——— ℥i
Glycerine ——— ℥i
Water ——— ℥viij ℏ.

---

Distemper in dogs.—

℞. Chlorate of Potash ——— ℥ij
Mindererus Spirit ——— ℥i
Sweet Spt. Nitre ——— ℥ij
Tinct. Henbane ——— ℥ij
Water ——— ℥ij ss ℏ

Give from a teaspoonful to a table spoonful, according to size, every 4 or 5 hours.—

I would suggest the administration of Chlorate of Potash and Hyposulphite of Soda, together with a small dose of Sulphur twice a day.— & the Syrup of Iodide of Iron.—

---

## Dynamite.

Consists of 75 Nitroglycerine, and 25 of fine sand.— with a little Alkali.— It transmits detonation at the rate of from 16,500 to 21,600 feet a second. Explodes by heat, or by percussion between metallic surfaces, at ordinary

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temperatures, but loses its tendency to explode at a low temperature. — It burns slowly when ignited in the open air, but explodes as quickly as Nitro-glycerine, when fired by a detonating fuse

---

Dose of Chlorate of Potash for a horse ℥ fs. —

℞

Chlorate of potash ——— ℥fs
Carb$^{t}$ Fer: ——— ℥ij Ats Thompson

---

Insecticide Powder

This singular powder so fatal to all insects, but perfectly innocuous to man and animals, consists of the ground tubular florets of the 'Pyrethrum rosea', a composite plant growing wild in the Caucasus.

---

Mix$^{t}$ for Influenza

℞

Vin: Ipecac: ♏ — vii
Paregoric — ♏ — XL
Tinct$^{a}$ Squills ♏X
Sp$^{t}$ Nitre — ♏XX
Inf: Linseed ℥ij Ats

To be taken at one dose every 3 or 4 hours

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## For Sting of Bee a Wasp

Apply ammonia, camphorated spirit, Eau de Cologne, or equal parts of ammonia Laudanum, and olive oil, taking a little brandy, or 13 drops of ammonia in half a teacup of water, internally.–

Rubbing the part with a slice of onion, will give immediate relief. Chewing the same and swallowing the juice, will afford relief, if sting inside the mouth a throat.–

---

## Naptha Varnish

Shell-lac 1½ lb: Naptha 1 gll: ready when dissolved, needs no filtering.–

Excellent for furniture.–

---

## Yorkshire relish.

Cayenne pepper 1 oz: 2 cloves garlick; 6 Shallots, bruised; 2 Tablespoonfuls Indian Soy; 2½ pints Vinegar; 1 gill Port wine; ½ lb brown sugar; 5 pints mushroom ketchup.–

Bottle for 6 weeks.–

or

Ketchup (home made) 1 qrt; Vinegar 1 pint; 4 cloves of garlic; 1 gill Indian Soy.; 1 oz: Salt; Cayenne pepper ½ oz: Brown sugar 1 oz:

Boil together, strain, and bottle.– 1 gill of Sherry will be an improvement.–

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## Glycerine.

Was discovered by Schele in 1779.— Pasteur shows it to be contained in all fermented liquors, especially wines, in quantity equal to 3 p.c. of the fermented sugar.— It is a product of the saponification of the various fats, though it does not exist as glycerine, but as a body whose composition is $C_6 H_5 O_3$. It is obtained from the manufacture of soap and stearine candles,— in the rectifier.—

---

## Transparent Varnish

| | |
|---|---|
| Mastic | 1 oz. |
| Sanderac | 4 oz. |
| Canada Balsam | 2 oz. |
| Methylated Spirit of 60% | 1 Pint |

allow it to stand in a warm place, with an occasional shaking till dissolved,— then pour off the clear for use.—

---

## Worms.

For small worms, R. Comp$^{d}$ powder of Scammony 8 gr.— Calomel 6 gr. aromatic powder 10 gr. Divide into 6 doses,— for a child 2 yrs old,— early in the morning.— Enemas of cold water or infusion of quassia, are useful.— For round or tape worm, turpentine and castor oil. Or Santonine

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Privates.

## Carbolic Oil for Wounds.

℞

Carbolic acid 1 pt. Olive oil 2 pts.

---

## Carbolic Water Wash.

Carbolic acid 1 pt. Water 40 pts.

---

## Sea sickness.

Apply Mustard over pit of Stomach, take a tea-spoonful of chloric aether in a wine glass of water. and a glass of sherry twice a day. — Sal Volatile or a 5 drops of Chloroform on sugar. - A light belt to compress the diaphragm is an excellent remedy. Suck pieces of ice. - Chloroform. Creosote, and prussic acid are useful, as also effervescent drinks. — But the best is

| | |
|---|---|
| Muriatic acid dilute | ℥ ij |
| Nitric acid dilute — | ℥ j |
| Prussic acid (Scheele's) — | m XVI |
| Water — — — — — | ℥ VIII |
| Sulph^te Magnesia — | ℥ IV. Aa. |

Two tablespoonfuls every 3 or 4 hours. —

or

Apply from 3 to 8 drops of Nitrite of Amyl on a

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handkerchief closely to the nose. The inhalation must be rapid, care being taken to prevent the admixture of any considerable quantity of air. A pulsation will be found in the temples, a sign of reaction, - followed by sleep. - Repeat if required in 24 hours. - Best after first vomiting. effectual in 121 cases out of 124. -

---

Bite of Mad dog. Dr Clark Newton

"Burn the wound with a red hot wire; or cauterize it completely to the bottom with Sulphuric, Nitric, Muriatic & carbolic acids. Excise the part, and apply a tight ligature above the part." I do not believe in this. Strong iodine liniment, I think will be a good safe guard. A solution of nitrate of silver is a good caustic. -

Stings of Wasps and Bees.

Extract the sting with tweezers, and apply carbon-ate of soda made into a paste with water. The pain will soon abate. - Ammonia or Sal volatile, & olive oil has been

Mr Hunter records, that of 20 people bitten by the same mad dog, only one took hydrophobia

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Privates.

## Tonic Mixt.

℞

| | |
|---|---|
| Sulp.t Quinine | ℥j |
| Sulphate Iron | ℥ss |
| Dil.t Nitric | ℥iv |
| Phos: acid | ℥iij |
| Water | ℥xxxiv Aqua. |

Take 2 Tablespoonfuls thrice a day between meals.-

---

## Permanganate of Potash.

The dose of permanganate to destroy foulness in the stomach, is 10 drops of the solution to 1oz water, twice a day.-

---

## Antiseptic for fever in children

℞.

| | |
|---|---|
| Strong Hydrochloric acid | gutt 20 |
| Tr: Squills | ℥ss |
| Water | ℥VIIIss Aqua |

Dose: 2 to 4 teaspoonfuls every 4 hours, in water.
Seldom required the third dose, before the fever abated.

Hy: Thompson

Sergeants.
Corporals.
Trumpeters
Farriers.
Privates.

## Fat Cattle to Measure

Take the girth behind the shoulder, and the length from the fore part of the shoulder blade to point of the tail head vertical with the buttock, in feet and decimals of a foot. Then multiply the square of the girth 5 times by the length, and then divide the product by 21,— The quotient will be the weight of the 4 quarters in stones of 14 lbs.—

If very fat, add $\frac{1}{20}$ th.— If very lean subtract $\frac{1}{20}$ th.—

The beef is little more than $\frac{1}{2}$ the live weight.— The skin weighing about $\frac{1}{18}$ th; and the tallow $\frac{1}{12}$ th. of the whole.—

---

## Mange in the dog

1st equal parts of Paraffin and oil.—
2d Lime and Sulphur lotion.
3d Sulphuret of Potass: rather apt to injure.—
4th Green Iodide of Mercury.
5th Iodide of Sulphur.—
6th Carbolic acid:— dangerous.—
7th Creosote; diluted with oil: active and safe.—
8th Infusion of tobacco
9th equal parts of paraffin and oil, with creosote $\frac{1}{20}$ th.—

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## Epilepsy from Lancet.

Dr Larrea y Gyezada of Peru describes his success-ful treatment of himself when 13 years of age, by 'Simulo'.— The fruit of a plant of the hyssop family —'Capparis Coriacea'.— The dose was about 11½ grs. of the powder in wine, night and morning.— Though he had 14 attacks, preceded by a distinct aura, (sensations which sometimes precede an attack, generally from below upwards) the cure was complete. And he has since employed it in practice with the best results.—

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## Sick or Nervous Headach

Has its origin in the brain, with which the stomach sympathises, causing nausea and vomiting.— a cup of strong coffee or a teaspoonful of Sal Volatile will often give relief.— But a specific now extensively used, is 15 gr: doses of Guarena given every night, or every 3 hours, when bad.— Chloride of Ammonia ℈ij in milk 3 or 4 times a day often relieves.—

Sergeants.
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## Hydrophobia & Snake bites

Some years ago, the Indian Govt ordered Aqua Amm: fort: to be kept at every Police station Dose: Adult, 35 gutt: in a wine glass of water; 12 to 15 years of age; 20 to 25 gutt: in half a glass of water: 8 to 12 years; 15 to 20 gutt: in the same quantity of water:- 4 to 8 years; 10 to 15 gutt: in ¼ wine glass of water: infants to 4 years; 3 to 10 gutt: in same:-

The Amm: was found to be a cure for hydrophobia in its worst form.- (Tit Bits.)

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## Respiration.

An adult man inhales 1 gall: of air at each breath, and consumes daily 30 oz: of oxygen.-

For the conversion of this 30 oz: of oxygen into carbonic acid, 13 oz: of carbon is required for a man, and 11 oz: for a woman.- Equivalent to 3 lb and 2½ lbs of bread respectively.-

The proportion of oxygen in the atmosphere varies.

| | |
|---|---|
| On Seashore | 21·00 |
| Confined houses | 20·75 |
| Bottom of Mines | 20·50 |

Heights of Mountains

Sergeants. Corporals. Trumpeters. Farriers. Privates.

By the barometer:- Atmospheric pressure diminishes 1° in every 33¼ feet.

---

Mixt. for Bronchitis

℞

| | |
|---|---|
| Carbt Ammn: | ℥ss |
| Oxymel Scillae | ℥vi |
| Tinct Camphor. Compd | ℥iv (Paregoric) |
| Spts. Chloroform | ℥ij (Chlorodine) |
| Tinct. Capsicum | ℥ss |
| Water | ℥viii |

Dose 1 Tablespoonful thrice a day

Hy: Thompson

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Tonic Mixt.

℞

| | |
|---|---|
| Sulphat. Quin: | ℈i |
| Hydrochloric acid | ♏xx |
| Dilute phosphoric acid | ℥ij |
| Sulphat. Magnesia | ℥iv |
| Inf: Quassia | ℥xij |

Dose: a tablespoonful in half a wine glass of water an hour after meals. 4 times a day. And at bed

Serjeants.
Corporals.
Trumpeters.
Farriers,
Privates.

time, the following

Nervine

℞ Bromide potass: —— ℥ij
Iodide Potass: —— ℥j
Ammonia citrate Tr: ℥ss
Sp[t]. Arom: comp[d] —— ℥iv
Infu: Cascarilla —— ℥vi

Dose: two tablespoonfuls at bed time.—

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Quinine & Iron Tonic

℞

Sulph[te] Quinine grs 64
Hydchloric acid —— ℥5
Tinct[r] Muriate Iron —— ℥10
Chloric Aether —— ℥5
Inf: Quassia —— ℥xvi Ats

Dose: 2 small teaspoonfuls twice or thrice a day in cold water. Note, each dose contains 1 gr: of quinine, and 10 drops of Tinct: Iron.—

№2

℞ Citrate of Iron gr: 36
Tinct: Orange peel ℥iv
Water —— ℥vi Ats

Dose: a desert spoonful (½ oz:) twice a day.
each dose represents 3 grs citrate Iron and quin

180

Serjeants. Corporals. Trumpeters. Farriers. Privates.

## Nervine tonic

℞

| | | |
|---|---|---|
| Tinct: Muriate Iron | —— | ℥ij |
| Dilute Phos: acid | —— | ℥ij |
| Tinct " Nux vomica | —— | ℥ij |
| Infus: Quassiæ | —— | ℥viij Aa |

Dose:

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## Worms

℞ Santonine gr ii to iv in a teaspoonful of Castor Oil. each morning for 2 or 3 mornings

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Serjeants.

Corporals.

Trumpeters.

Farriers.

Privates.

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Corporals.

Trumpeters.

Farriers.

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Trumpeters.

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Privates.

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Privates.

Serjeants.

Corporals.

Trumpeters.

Farriers,

Privates.

No 81 Iron Gun throws a shot of 1260 lbs at a velocity of 1550 feet a second. — And the recoil is 21,115 $\frac{11}{16}$ lbs. —

Weight of Shot. –

| Pellets | No | weight | weight of 1 Pellet | Impact at 1,000 ft. per S. |
|---|---|---|---|---|
| 20 | 6 | 35·1 grs: | 1·755 grs: | 3 lb: 14 oz |
| 20 | 5 | 40·1 " | 2·005 gr: | 4 lb: 7 oz: |

---

July 20th 1875. – Kill with minnow in Breamish 7 Trout weighing 5 lb: largest 1¼ lb: Lengths 9, 11, 12, 12½, 13¼ and 14½ inches. –

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Galvanometer. –

For small resistances one of 3 or 4 ohms is best say No 24 or 26 ✠ covered wire – 6 or 7 oz: upon a frame for 1 inch needle Astatic needles suspended on silk. Sewing needles or watch spring will make the best needles. –